THE

Malayan Agricultural Journal.

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EDITORIAL.

The School of Agriculture, Malaya. Attention has been drawn, in a previous number of this journal, to the fact that the School of Agriculture will be ready for occupation this year. Considerable progress has recently been made in providing the necessary equipment, and it is hoped that students will be able to commence their training about the third or fourth week in May. A large number of applications has already been received, from all parts of the Peninsula, for admission to the School; the majority of these applications are for free tuition and maintenance, and for subsequent employment in the Department of Agriculture, while the number of *bona-fide* candidates for admission as private students is fairly satisfactory considering the present acute financial depression.

The time is opportune, however, for emphasising the fact that the School is intended primarily for the benefit of private agriculturists, and not merely for the training of Malay officers in this Department. The cultivation of crops by Asiatics in this country is commonly conducted along unscientific lines, while their methods of preparing and marketing agricultural produce are, in general, capable of considerable improvement. It was largely to remedy these defects that the provision of a School of Agriculture was first conceived; and now that the School is within a few weeks of being opened, it is most desirable that everyone—and particularly those engaged in local agriculture—should realise the facilities for improvement which can be anticipated from the training offered at the School.

Two courses of instruction have been carefully designed to meet the requirements of local agriculturists. It is intended that the Three Years Course should be particularly thorough in scope, offering theoretical and practical instruction not merely on the pure sciences which underly the art of agriculture, but also on the actual cultivation, preparation and marketing of crops suitable for production in Malaya. The One Year Course is necessarily restricted by comparison, but is essentially practical.

The outlets for private students who have completed their training at the School are two-fold: firstly, as responsible employees on the large estates,

secondly, as efficient managers of their own properties or of estates belonging to friends or relatives. The School diploma will stamp its owner as a man of definite attainments and agricultural training, and we see no reason why, in due course, young men holding this diploma should not find employment on European and other large estates in this country. It may, in time, prove desirable to create an Agricultural Appointments Board as a means of contact between post students of the School and prospective employers; but the creation and development of such an institution is obviously a matter, in the first place, for private enterprise. It is perhaps in the second direction, as managers of smaller Asiatic estates, that greater scope at present exists for absorbing private students on the completion of their training. Thousands of Asiatics are already employed in this manner; but, as we have already claimed, their knowledge and methods are capable of improvement in various directions. This improvement will be forthcoming to a considerable extent if Asiatic agriculturists will undergo a course of training at the School. It is largely for their benefit that the School has been erected; and they will learn that it is in their own interests, financially and otherwise, to avail themselves of the training now offered.

Rubber Statistics. In this number, we publish an article, supported by graphs, on "A Review of the F.M.S. Statistics Relating to Rubber Production" by Mr. J. Gordon-Carrie. It is suggested that this article be read in conjunction with an article of a similar nature dealing with the 1929 statistics which was published in the *Malayan Agricultural Journal* of January 1930, and with the rubber statistics published monthly in this Journal since that date.

It is pointed out that a comparison of the production rates of small holdings and large estates for 1929 and 1930 shews a tendency for the production on large estates to increase and for that on small holdings to be less. The convergence of these graphs leads to the conclusion that at the end of 1931, the production rate on large estates and small holdings will approach very closely and that it is even possible that they will exchange positions within a year or eighteen months from date.

In this connection it is to be noted that the native rate shews wider and more frequent fluctuations over the periods reviewed than do the large estates so that the possibility of convergence of the two graphs or the date of such convergence is somewhat conjectional. Further, the tendency is for the production rate of large estates to increase more rapidly than that of the small holdings to decrease.

The point of convergence of these production rates, however, is of less moment than is the actual rate at which they converge. It seems to us probable that this point of convergence if indeed there be such, will be at a point above 500 lbs. per acre, which will mean that the low price of rubber has resulted in the adoption on large estates of systems of tapping which have not only lowered the cost of production, but have resulted in increased yields.

On the other hand, the economic situation, as the author points out, has led to excessive tapping on small holdings, the result of which he expects will decrease yield rates in the near future. The duration of diminished yields from small holdings is closely connected with questions of tapping systems and the rate of bark consumption. The yields in years subsequent to 1932 will therefore depend on such factors as rubber prices and tapping policy which cannot be forecasted at present. A close study of bark consumption and general condition of small holdings is at present being conducted by this Department in conjunction with the Rubber Research Institute of Malaya. It is hoped that the conclusions drawn from this investigation will enable a more accurate estimate to be made of the future production on small holdings.

In passing, we would draw attention to the non-effectiveness of the voluntary restriction scheme, known as the " May tapping holiday " as far as native production was concerned. This result rather emphasises the opinion that voluntary restriction of rubber production will never prove effective in view of the large share of production held by the small-holder.

Information on Rubber from Small Holdings.

Since the above Editorial was sent to the press, further important information has been received regarding rubber on small holdings in Malaya and the Netherlands East Indies, which induces us to re-open this column for additional comments on this subject.

In this number will be found two articles dealing with small-holding rubber in Malaya and the Netherlands East Indies. The article on the conditions of small-holdings in Malaya during the first quarter of 1931 has been written by the Field Division of this Department in consultation with the Statistical and Economic branches and with the Rubber Research Institute of Malaya. The second is a translation of the sixth report on native rubber cultivation in the Netherlands East Indies, covering the period from September, 1930 to March 18th., 1931 by Mr. A. Luytges, Chief of the Division of Agricultural Economics of the Agricultural Information Service, Netherlands East Indies. We are indebted to His Majesty's Consul-General, Batavia, for this important translation. The translation of the fifth report will be found in the *Malayan Agricultural Journal* of December, 1930.

Readers are thus placed in possession of the most recent available information regarding rubber production on small-holdings in Malaya and the Netherlands East Indies.

The factors which influence the production of rubber in Malaya and the Netherlands East Indies vary considerably. It will be noted that in Malaya the policy adopted has been and is, intensive tapping, while in the Dutch Indies, the considerable fall in prices last year resulted in decreased production of rubber from small holdings as the natives possessed alternative means of livelihood. It was anticipated that the amount of rubber exported would still further decline, but the experts have been compelled to revise their ideas on account of two facts,

one of a temporary nature and the other likely to be more permanent. The necessity of possessing ready money for the payment of Government taxes and for the Mohamedan festivals led to a renewal of tapping in many cases. But the more important factor has been that the native has adopted a lower standard of living which has resulted in a drop in commodity prices in rural districts by as much as 30—50 per cent. In addition, the activities of a processing company has led to a more economical system of exporting rubber.

From all these evidences, it would appear that, in spite of the low price of rubber, the export of rubber from small holdings will, at least in this year, be fully maintained.

In view of the importance of this subject and the anticipated demand for this information in a convenient form, we have prepared a reprint containing the following :—Editorials on rubber appearing in this number, Review of F.M.S. Statistics Relating to Rubber Production in 1930; Conditions of Small Rubber Holdings in Malaya, first quarter 1931; Translation of Sixth Report on Native Rubber Holdings in the N.E.I.; Areas out of tapping in the F.M.S. and S.S. during the first quarter of 1931 and Malayan Rubber Statistics for March 1931. In addition, the reprint will contain a typed table shewing the range of prices for small-holding rubber in various localities in Malaya. The price of this reprint is 25 cents per copy.

Mechanical Cultivation of Rice.

The interest aroused by the publication last year of two articles in this Journal on mechanical rice production in Southern Siam and in Australia has led to a more detailed study by Mr. J. Lambourne of the experiences gained in various parts of the world in this method of cultivation here summarised under the title " Mechanical Cultivation of Rice." We wish in this place, merely to reiterate our conviction that this method might be more widely adopted in this country; an opinion which is amply supported by its successful application in other parts of the world. These articles together with two book reviews on tractors should place at the disposal of our readers an adequate bibliography on this subject.

A Pest of Nipah.

We have previously given evidence that the pages of the *Malayan Agricultural Journal* are open to the public for the purpose of publishing articles dealing with research work of value to agriculturists in the tropics. On another page will be found an article on the " Life Cycle of a Fly Pest (Anthomyiid) on *Nipah fructicans* " by Mr. J. W. Sewill which provides further proof of our policy in this direction.

When the nipah plant was considered solely as a source of roofing material, a pest of the inflorescence was of little interest and without economic importance. But the utilisation of this plant as a source of power alcohol in a mechanical age such as the present, adds emphasis to the importance of this pioneer industry in Malaya. As the raw material for alcohol production is obtained from the spathes, a new importance attaches to such a pest as forms the subject of this article.

Original Articles.

A REVIEW OF F.M.S. STATISTICS RELATING TO RUBBER PRODUCTION

BY

J. Gordon-Carrie,

Deputy Registrar-General of Statistics, S.S. & F.M.S.

In the *Malayan Agricultural Journal* of January, 1930, an article was published to which the present one is intended to be supplemental. The charts which illustrate this article are planned on the same lines as those that accompanied the article referred to above and continue production statistics from January to December, 1930. Attention is directed in particular to the following paragraphs of the previous article :—

" In general, the owners of holdings less than 100 acres in area do not hold rubber off the market but sell as they produce. There are, however, times when for a few days the sales are retarded : and when such times occur at the end of a month the total sales in that month are lessened by an amount which, almost always, goes to swell the total sold in the next month.

" For that reason the total production by holdings of less than 100 acres in any one month cannot be deduced directly from the statistics published monthly. These give, by the use of a simple calculation, the amount of the total sales during the month of rubber by such holdings.

" If, however, the amounts sold monthly are averaged over three or four months, the figure so arrived at gives the average rate of production during that period. Thus, by the simple process of taking averages over periods of that duration, each such period progressing by one month, it is possible to arrive at estimates of monthly production which are almost exact. (The margin of error is within an extremely small percentage.)

" Another factor of some importance is that crops harvested monthly by big estates—which are declared, and which Chart B illustrates—are, for statistical purposes, open to the objection that apart from seasonal variations they are also subject to the influence of their differing time components : e.g., April's crops are harvested in 30 days, as are June's, while the crops in the mid-month of May are garnered in 31 days.

" It is, therefore, essential that any charts which can be regarded as correctly indicative of comparative yields shall illustrate monthly yields in terms of yield per day in each month. A further and useful development of that principle is to express such day-monthly yields in terms of equivalent yield per acre per annum."

Chart D illustrates the production rate of the estates of 100 acres or over as compared with holdings of less than one hundred acres in area. It is well known that of the latter, more than ninety-nine per cent. are small holdings of

which the average area is about two and one half acres each. The graph of the production of the big estates is, as was the case last year, that obtained by plotting the total production of those estates divided by their mature tappable area. It must be pointed out that this method for the year 1930 is not wholly correct as for some months many of larger estates have been reducing the area actually tapped by ceasing to tap their lower-yielding areas. If the crops harvested were divided month by month by the actual area tapped, somewhat higher yields per acre would be indicated. A further factor is that the area tapped by A.B.C. systems has increased during 1930 and the first result of a change over to that system from the normal alternate day system is a falling off in yield. It is hardly practicable to determine exactly how far the two mentioned factors offset each other and as the proportion of the areas concerned, as compared with the total mature area, is small there would be little if any advantage gained by any attempt to adjust the curve of the graph to the varying areas monthly. If the present indications are proved to be a true forecast of events during 1931, any graph for this year will have to be plotted with quarterly adjustments as regards the area tapped, but as has been indicated, the variation during 1930 was not such as to justify the methods.

It will be seen that throughout 1930 the production per acre on small holdings was maintained at a higher rate than that of the larger holdings. On the former, economic necessity has caused the heaviest possible tapping to be adopted. There are many conflicting opinions as to how long this heavy tapping can be continued before it so affects the small holdings bark position as to reduce their output seriously, but a comparison of Chart D for 1930, published in this issue, with that published last year for 1929, though not very conclusive, at least indicates that by the end of 1931 the graphs of production of the big and small estates will approach very closely. In the writer's opinion—formed after close inspections of small holdings all over the country—it is possible and even probable that they will exchange positions within a year or eighteen months from date. It should be understood that this convergence must not be taken as an indication of a permanently marked decline in native production.

Charts C and D are chiefly interesting on account of the clear way in which they show how loyally the large estates as a whole, observed the tapping holiday in May 1930 compared with the non-observance of the tapping holiday by the small holders.

On a few of the Asiatic-owned estates of medium size the monthly returns show that heavier tapping has been started in an attempt to harvest larger crops, but in the great majority of cases, in fact on big estates as a whole, the tapping during 1930 was lighter than in 1929. Statistics as a whole shew that there is hardly a single instance of an estate which has given a trial to the A.B.C. system or to the system of tapping on one-third cuts on alternate days reverting to any heavier system of tapping. There are a few estates which still tap daily on half or quarter cuts, and the system of daily tapping over half the area for alternating periods of three months yet has a few adherents. The results on

some of the best areas tapped by the short task and early tapping system now usual on many, if not most, big estates are very striking. It is hoped later in the year to publish graphs illustrating certain instances of that system when the records now collected have been checked.

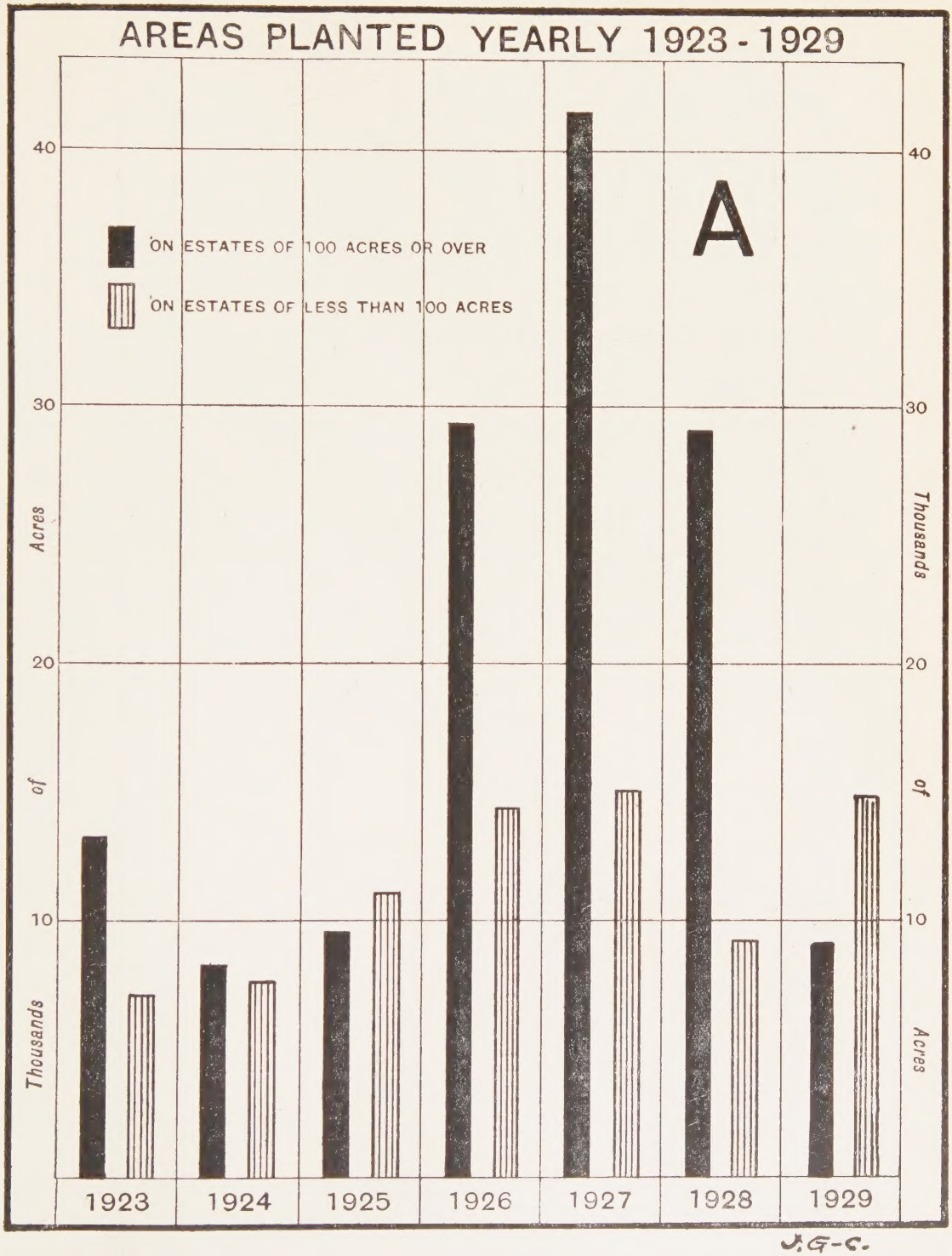
The whole question of the bark position and yields of small holdings is the subject of work now being undertaken by Field Officers of the Department of Agriculture and the Rubber Research Institute of Malaya. A very considerable amount of inspection work has been done which reveals that the average height of the tapping cuts on small holdings is greater than it was a year ago. Various expedients to obtain more latex have been observed. The tapping of superimposed cuts is common and not a few instances have come to notice of tapping by the light of lamps before daylight. Towards the end of the year under review, many small holders ceased to tap, but there were many cases in which tapping was subsequently resumed after it had been stopped for a period. In some of these cases it was proved that after attempts to arrange tapping on the share system had failed, lack of any other means of livelihood compelled the owners and members of their families to tap their own trees. However, although so far there has certainly been no wholesale cessation of tapping small holdings in the F.M.S., the position is otherwise on the island of Singapore. The Singapore holdings, it is well known, were heavily tapped during the restriction years and did not benefit by the enforced light tapping or periodical rest while waiting for a new issue of coupons. They were, in fact, tapped for six years much as the F.M.S. holdings have been for the past two years. Regarding their condition the fact is evident that many have not been tapped for months for the reason that the yield obtained at the last tapping was almost negligible.

A factor which, unfortunately, the charts published do not illustrate, is that the glut of low grade scrap rubber which flooded the market just after the removal of restriction was followed by a period when such rubber, as collected on the small holdings, became almost valueless. This resulted in more care being taken in its collection and during the greater part of 1930 there was a market for scrap rubber from such holdings. The amount was less in quantity but far better in quality. Examination of rubber in F.M.S. dealers' hands during the past year has proved that the quality of sheet rubber produced on the average small holdings is of greatly improved standard and that the sheet rubber produced on the larger Asiatic owned estates is now equal to that produced on the European owned estates.

The figures published in this Journal monthly may be suggested as a profitable study for those interested in the monthly proportions of the grades of rubber in dealers' hands; it should, in that connection, be remembered that almost the whole of the F.M.S. dealers' stocks are purchased from the small-holders and the smaller of the Asiatic-owned estates, as very few of the European-owned estates sell their rubber to F.M.S. dealers. The greater part of Straits Settlements dealers' stocks of lower grades of rubber is imported from the Netherlands East Indies.

These monthly tables show how close is the relationship between the production of estates and their stocks. There is little or no holding up of rubber on estates in the F.M.S., and in general, it is equally clear that the F.M.S. dealers sell as soon as they purchase. As was indicated by figures published, there have been periods when the Chinese dealers accumulated stocks for the purpose of speculation. During 1930 the range of price—as well as the average price—was the lowest on record in the history of the plantation rubber industry. Also, and the fact is important, during 1930 it has never paid to hold rubber off the market for more than a very short time.

It may, in conclusion, be mentioned that there will, in future, be available for inspection at the Department of Agriculture a series of graphs and charts, kept up to date, illustrating most of the more important official records which refer to the rubber industry.


AREAS PLANTED YEARLY 1923 - 1929
A
ON ESTATES OF 100 ACRES OR OVER
ON ESTATES OF LESS THAN 100 ACRES
Thousands of Acres
Thousands of Acres
40
30
20
10
1923
1924
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1926
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1928
1929
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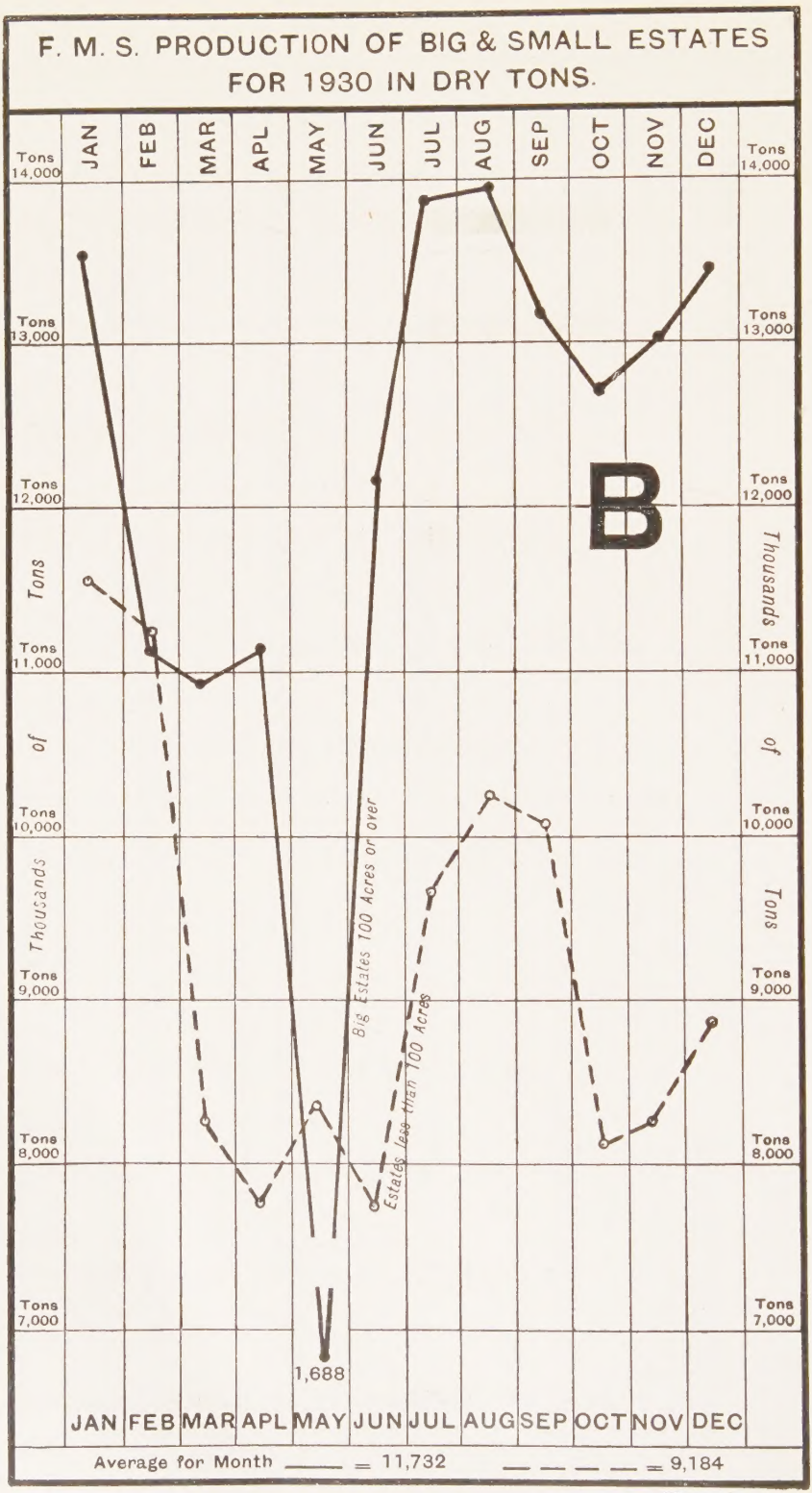
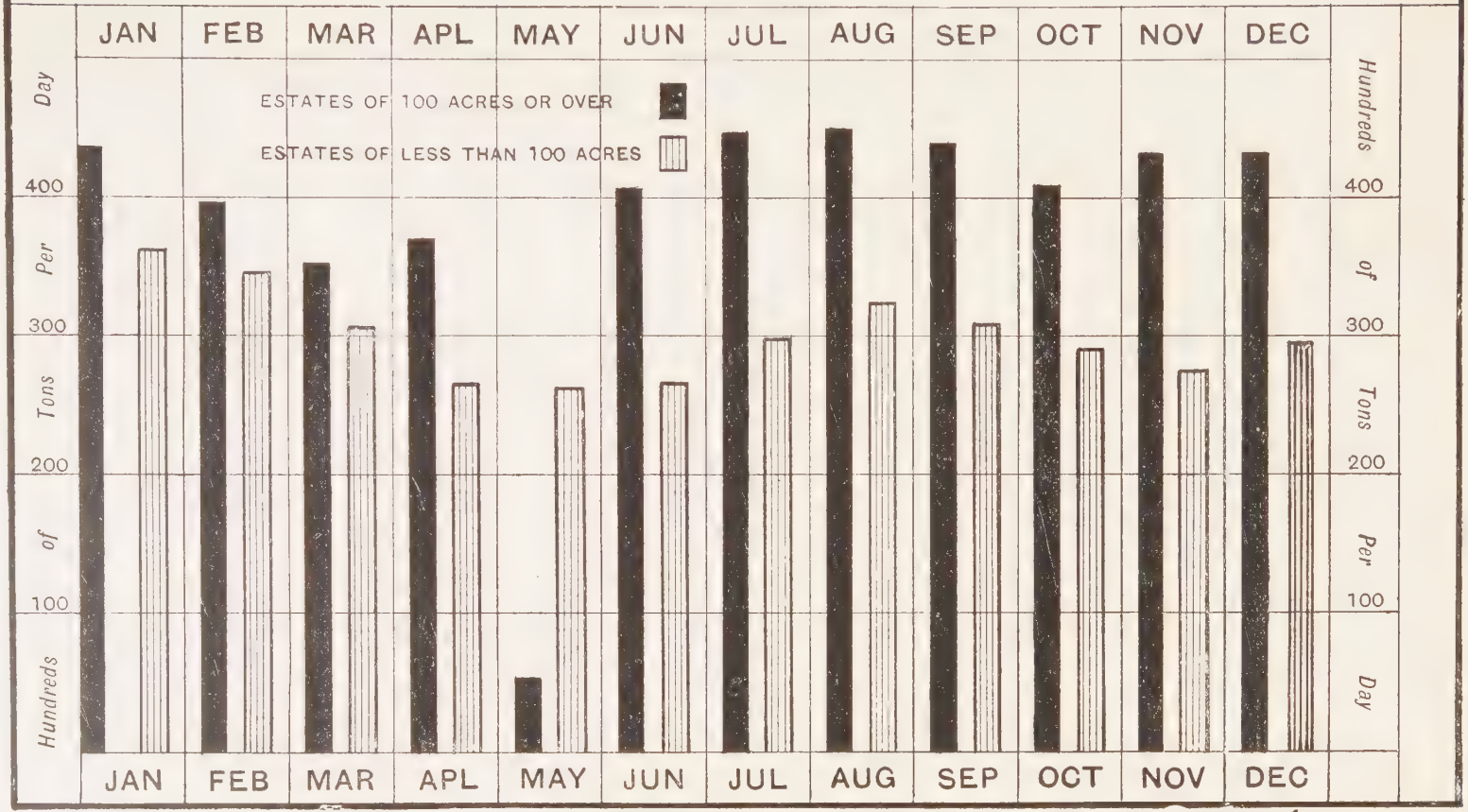

F. M. S. PRODUCTION OF BIG & SMALL ESTATES
FOR 1930 IN DRY TONS.
JAN
FEB
MAR
APL
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
Tons 14,000
Tons 13,000
Tons 12,000
Tons 11,000
Tons 10,000
Tons 9,000
Tons 8,000
Tons 7,000
Thousands of Tons
B
Big Estates 100 Acres or over
Estates less than 100 Acres
1,688
Average for Month ——— = 11,732 — — — — = 9,184
J.G-C.

F. M. S. RATE OF PRODUCTION

(In Tons Per Day)

1930

C

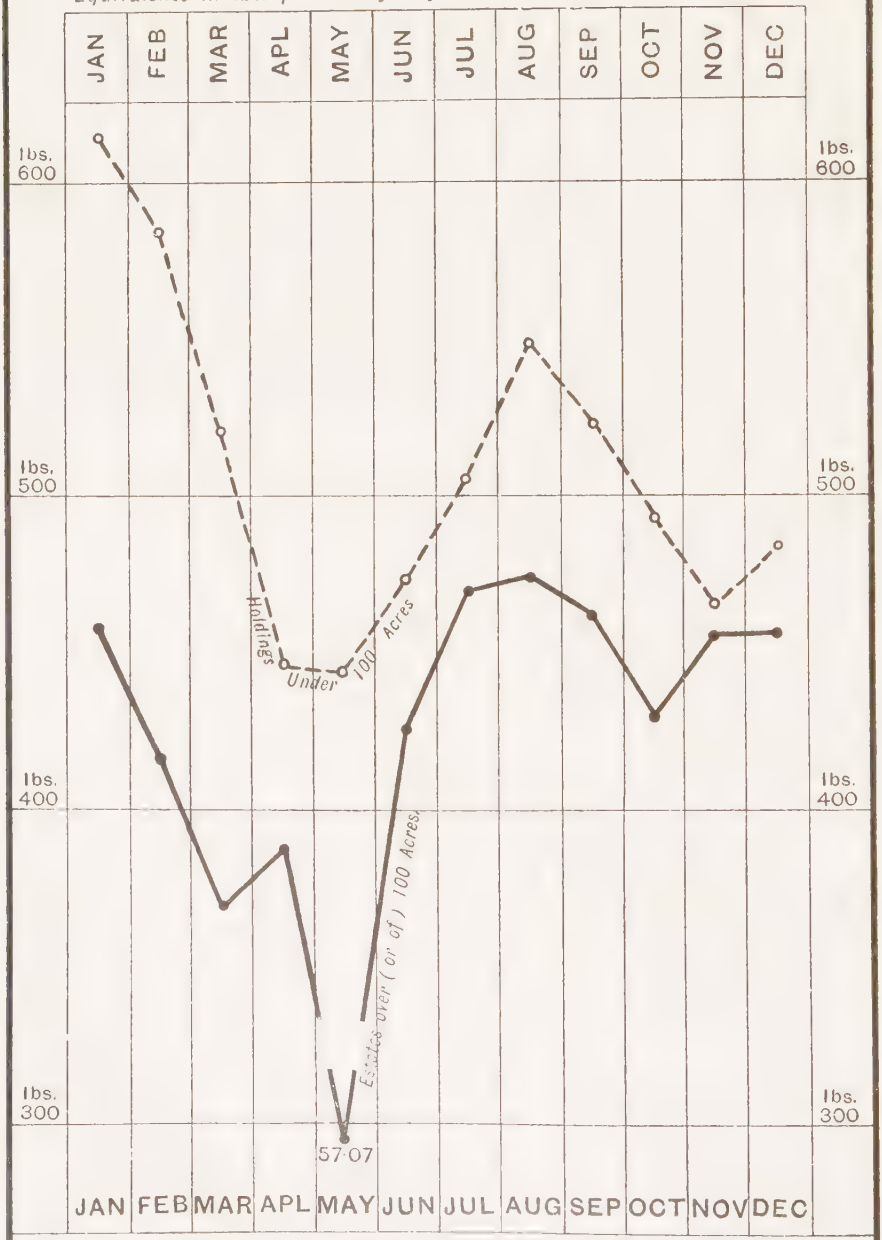


J.G-C.

F. M. S. PRODUCTION RATE

Note:-
This graph illustrates the yields on Chart C in terms of their Equivalents in lbs: per acre yearly.

D



MECHANICAL CULTIVATION OF RICE

BY

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Introduction.

The information contained in the following article has been compiled with a view to bringing together as much information as possible on the cultivation of rice by means of modern tractors and other machinery.

Tractors and machinery have been used with success in the cultivation of rice in parts of the United States of America, Brazil and Southern Europe, notably Italy, for some years. Modern machinery has also been used in recent years for the cultivation of this crop in New South Wales, Australia. Although the cultivation of rice lands with tractors, ploughs and disc harrows was practised in Siam as long ago as 1912 [1] and experiments in the use of tractors and ploughs were carried out in Cochin China [2] and Malaya [3] in 1917 and 1922 respectively, it is only during the last 5 or 6 years that large scale rice farming with modern machinery has been practised in the eastern tropics. It is stated that both in Siam and Indo-China, power equipment has been used extensively with satisfactory results, both as regards costs and amount of work done.

In Travancore, India, [4] a Fordson Tractor has been used with success for ploughing in an experimental padi farm for some years and it is said to be more efficient and less costly than bullocks or buffaloes. There appears to be no record of large scale padi farming with modern machinery in India, although tractors and machinery have been in use for the cultivation of other crops.

Selection of Land.

Land for the purpose of rice cultivation on a large scale should be level or have but a gentle slope, so that bunds for retaining the water are far enough apart to allow of fairly large bays. The soil best suited to rice cultivation is a clay loam with an impervious clay sub-soil fairly near the surface. Loamy and even sandy soils are said to produce good crops of rice under ideal conditions of irrigation and drainage but it is necessary that there should be an impervious sub-soil near the surface, otherwise considerable loss of water may occur. At the same time, the land should be capable of being easily and efficiently drained, otherwise considerable delay may occur at harvest time, with a probable loss of crop.

Preparation of Land for Irrigation.

The most suitable land for padi cultivation in Malaya, apart from that already used for that purpose or planted with other crops, will most probably be covered with jungle. Before machinery can be used on this land it will be

necessary to clear it of all timber and stumps, which may prove somewhat expensive. Once the land has been cleared, levels will have to be taken to ascertain the position of the bunds. The bunds should be made according to the contour of the land and high enough to retain water to a depth of at least 6 inches. In the United States of America,[5] where machinery is used, bunds of a permanent nature are built not less than 10 feet wide at the base with sloping sides so that they are not damaged by machinery passing over them. If bunds are built in this way it is said that the whole field can be cultivated as one unit, rice being grown on the bunds as well as on the rest of the field. Wooden gates are provided at intervals in the bunds to allow the water to flow from one field to another. These gates are usually of the box type fitted with narrow horizontal boards so that the depth of the water on the bays may be regulated.

Method of Making Bunds.

In the United States of America[5] bunds are usually made in the following manner :—A survey of the land having been made and the position of the bunds pegged out, the survey pegs are connected by ploughing a furrow to mark the base of the bund. All corners are rounded off so that machinery can be used close to the bunds. The land on this contour is then ploughed with a tractor drawing a 10—12 furrow plough back furrowing to the first furrow. The main bunds are often built with a "Fresno Scraper," the interior bunds being made with what is known as a "Checker" drawn by one or two tractors, depending on the size of the checker and the horse-power of the tractors used. On large areas these outfits are said to be able to build 10 to 15 miles of bund per day.

The checker is generally home-made and consists of planks 3 inches thick, 12 inches wide and 16 to 24 feet long. Two or three of these are fitted together to form one wide plank which is lined with steel. Two of these wide planks are braced together on edge 10—18 feet apart at one end tapering to 3 to 6 feet apart at the other forming two sides of a box. The upper edges are set slightly farther apart than the lower edges so that the planks slope outwards. This implement is drawn wide end forward and the loose surface soil is drawn through the narrow end making bunds 12 to 24 inches high and 4 to 6 feet wide at the base.

In Siam[6] and Indo-China, a Martin Ditcher has been used for making bunds.

Where large areas of land are being opened, mechanical drain diggers might be used for making irrigation canals and Scrapers or Road Graders drawn by tractors could be used for levelling the land.

Preparation of the Seed Bed.

The object to be attained in preparing land for padi is a fine tilth; the land is therefore ploughed to a depth of 4 to 5 inches either with mould board or with disc ploughs. It has been found both in Siam[6] and Indo-China that a disc

plough provided with 10—13 discs fitted vertically on a spindle, the discs being set at an angle of 45° to the line of draft is best suited for ploughing newly opened land. Examples of such ploughs are the Wheatland plough made by J. I. Case & Co., Wisconsin and the McCormick Deering harrow-plough. These ploughs cut to a width of 8 to 9 feet, and when drawn by a tractor, are capable of ploughing over 20 acres per day. For land that has been under cultivation, in order to turn in the stubble and weeds, the mould-board type of plough is preferable.

After the land has been ploughed, it is harrowed with tandem disc harrows, several types of which are on the market—followed sometimes with spike harrows. Wooden drags made with heavy planks bolted together are dragged over the land to break the clods of earth and level the surface. A soil pulveriser or "ring roller" may be used with advantage on some land to obtain a smooth and firm seed-bed. The amount of working required to obtain a fine tilth will depend on the nature of the soil.

Sowing the Seeds.

The seed can be either drilled or broadcasted. Drills, Endgate broadcast seeders or combined fertilizer and seed drills can be used for this purpose. On well prepared land the drill is said to distribute the seed more evenly and at a more uniform depth; consequently a more even stand of plants is obtained than is possible with a broadcast seeder and usually less seed is required. On the other hand, with a comparatively rough or wet seed-bed and when time is a consideration, the broadcaster does the work more rapidly.

Irrigation.

Water for irrigation can be obtained by gravity from higher levels, but it is often obtained from rivers, streams or deep wells, from which it has to be lifted by powerful pumps. It is distributed over the area to be irrigated by means of canals and smaller distributaries. In the Gulf coastal plains of the United States of America[7] the pumping plants, canals and sometimes the land are under the control of private companies, who furnish water on a rental basis, either taking part of the crop or a fixed rate in cash for the use of the water.

Pumps.

Pumps used for irrigating padi land vary with the conditions under which the water has to be obtained. For lifts up to fifty feet centrifugal pumps are often used. If the quantity to be raised is great and the lift low the Humphrey Automatic pump is said to be the most efficient. It acts by recurrent gaseous explosions which keeps a current of water moving. There is no piston, the only working parts being automatic valves that admit water and control the supply of explosive mixture, and the exhaust. Where there is a head of water, hydraulic rams are convenient and economical.

On a 600 acre farm in Siam,[6] a Kimball 12 inch turbine pump with a 6 feet lift and a discharge of 3,000 gallons per minute is being used. This pump, which costs approximately $2,000, is driven by a belt from a 12/20 H.P. Tractor supplying water at a cost of about $3.50 per acre per annum.

The size and capacity of the pumping outfit required will depend on the acreage to be irrigated, the height to which the water has to be lifted and the nature of the soil. The capacity of the pump should not be less than 6.3 gallons i.e. one cubic foot per minute per acre. Less compact soils require more water as allowance has to be made for seepage. About 4½ acre feet of water is said to be sufficient for a crop of rice. In Krian, it is said that one cusec (373.6 gallons per minute) is sufficient to irrigate fifty acres.

Irrigation of the Crop.

The first irrigation usually takes place after sowing the seed, but where the land is very hard and dry it is sometimes necessary to irrigate in order to make cultivation easier and to obtain a fine seed bed. In the United States of America only sufficient water to germinate the seeds is allowed on the land and after 2 days this water is drained off. A second irrigation is given before the soil becomes dry and caked, but this water is drained off quickly. Irrigation takes place once every seven or ten days until thirty days after the seedlings appear above ground, when the land is gradually submerged to a depth of about 6 inches. This depth of water is maintained on the land for 90 to 140 days depending on the variety of padi under cultivation. Where rain falls at the right time it may not be necessary to irrigate until the padi plants are 10—12 inches high.

Drainage.

Good drainage is important, since as the crop approaches maturity, the level of the water must be lowered. Previous to the final draining, no water should be allowed to enter the land for about 10 days, during which time the water level is gradually lowered. Draining usually takes place when the panicles are well turned down and the lower grains are in the soft dough stage; at this time the upper two-thirds of the grains on the panicles are turning yellow.

Harvesting.

Harvesting usually takes place from 10 to 18 days after the removal of the water, but care should be taken that the crop is neither under nor over ripe. In the United States of America,[7] the best time to harvest is said to be when the heads are well turned down and the grains in the lower part of the panicle are in the hard dough stage. If the crop is harvested too early a large number of light grains will result, while if the crop is over-ripe shattering will take place and grain will be lost.

Twine binders or combined Harvester-Threshers are used for harvesting the crop. The latter machine does the three operations of harvesting, threshing and winnowing, but difficulty is experienced with this machine where uneven ripening of the crop takes place. The twine binders used for reaping padi are usually fitted with auxiliary engines which drive the knives and other working parts, owing to the fact that the "bull wheel" which does the work on dry land, may not be able to get a grip where the soil is wet and muddy, as it is liable to be on irrigated land. The above machines can be drawn by motor tractors and are said to be capable of binding 35—40 acres per day.

When reaper binders are used the sheaves are shocked in the field in a similar manner to wheat and oats, in temperate countries, but in Malaya this may not be possible owing to weather conditions. In the United States of America these shocks are capped to protect them from sun and rain which may cause the splitting of the grains. Capping is done by slipping the band of a sheaf up to near the heads of grain and then placing it head downwards on the top of the shock turning the straw down evenly all round to form an umbrella-shape shelter.

Threshing.

Threshing should not take place until the grains have had time to harden and it is essential that the heads should be prefectly dry. Threshing should not, therefore, take place in the early morning before the dew has evaporated. Threshing machines, similar to those used for wheat, are used for threshing rice, but the teeth of the cylinder should be set rather wider apart, otherwise the grains are liable to be cracked. Special rice threshing machines are now made.

Yields.

In countries where rice is cultivated on a large scale with modern machinery and where attention is given to manuring, the average yields per acre are greater than in most eastern countries where primitive methods of cultivation still prevail. Average yields of from 1,800 to 5,900 lbs. (320 to over 1,000 gantangs) per acre are obtained in the United States of America, Italy and Spain, while yields of 2,530 lbs. (450 gantangs) are recorded from areas cultivated with modern machinery in Australia and Siam. The average for the whole of Malaya is in the neighbourhood of 200 gantangs (1,125 lbs.) per acre although much higher yields are obtained under controlled irrigation in favoured areas. It is not claimed that, given the same conditions, larger crops can be obtained by the use of modern machinery, but that larger areas can be handled at a cheaper cost and that profitable crops can be obtained by this method of cultivation.

Tractors.

There are a large number of types of tractors on the market and at recent tractor trials held under the auspices of the Royal Agricultural Society of England in conjunction with the Institute of Agricultural Engineering, Oxford University, thirty-three tractors were entered. These tractors were of three main types as follows :—

1. Paraffin driven tractors all of the wheeled type.
2. Petrol driven tractors of both wheeled and track laying types.
3. Fuel Oil tractors with both Diesel and semi-Diesel engines all of the wheeled type.

The average amount of fuel and lubricating oil used by the different types of tractors taking part in the above-mentioned trials together with costs based on present market prices of fuels and lubricating oil in Malaya are given in the following table.*

Type of tractors.	Average consumption of fuel per 100 horse-power hours.		Cost of fuel 100 horse-power hours.		Cost of fuel per acre for ploughing @ 5½ acres per 100 h.p. hours	Average lubricating oil consumption per 100 h.p. hours.	Cost of lubricating oil per acre.
	Drawbar	Belt.	Drawbar	Belt.			
	Gall.	Gall.	$	$	$	Gall.	$
Paraffin (Kerosene) Tractor.	14.37	10.16	8.23	5.81	1.48	0.36	.14
Petrol Tractor.	12.90	10.57	10.83	8.88	1.79	0.20	.08
Diesel Tractor.	9.19	6.12	1.71	1.14	.31	0.57	.22
Semi Diesel Tractor.	11.50	7.98	2.41	1.67	.44	0.45	.18

* These trials were conducted on ordinary arable land, not on padi land.

The above costs are based on the following prices :—

Kerosene in 4 gallon tins @ $2.29 per tin.
Petrol in 4 and 65 gallon Drums @ 84 cents per gallon.
Diesel Oil in 65 gallon Drums @ $12.50 per drum.
Solar Oil in 65 gallon Drums @ $13.60 per drum.
Lubricating Oil in 42 gallon Drums @ $2.15 per gallon.

It is stated that an estimate based on the performance of thirteen tractors indicate that 100 horse-power hours work on drawbar were required to plough 5½ acres of land on which the ploughing tests were conducted at a depth of 4½ inches.

Trials with different types of tractors have also been carried out in Siam and the results of these trials kindly supplied by the Bureau of Agricultural Science, Bangkok, are reproduced in the following table. The amount of work done and costs of fuel used have been converted to acres per hour and costs per acre in Straits currency respectively :—

Type of Tractors and Horse-Power	Implement used.	Soil.	Depth ploughed inches.	Acres per hour.	Fuel costs per acre.
Lanz 22/28 Crude Oil "Bulldog"	3-disc plough.	Very heavy clay, dry	4	0.60	0.90
do.	5-share plough	Medium clay dry	4	1.14	0.60
do.	„	do.	4	1.48	0.52
do.	„	Medium silty clay.	4	0.96	0.80
McCormick Deering 20 H.P.	12- Disc plough	Spongy clay.	4	1.20	1.00
McCormick Deering 10/20 H.P.	„	Light silty clay	4½	2.00	0.52
McCormick Deering 15/30 H.P.	Mould Board 4—14"	Clay virgin soil under grass.	5	1.60	1.00
Fordson 24 H.P.	18" 2-share plough 24 Disc harrow 18" Discs.	Raised land clay, not so compact as a padi field.	6-7	0.25	1.28*

The above costs are for fuel and lubricating oil only. In order to arrive at the total cost of tractor work it is necessary to include allowances for interest

* Cost of three operations, ploughing harrowing and cross-harrowing.

on capital, depreciation, repairs and labour. The cost of these items is not given in the reports in question.

The writer is informed that two farms in Siam, one of which is 700 acres, are operated with tractors and modern machinery. On one farm a 10/20 H.P. McCormick Deering tractor operating a 6 feet harrow-plough, completed 20 acres per day of 10 hours at a fuel cost of 60 cents per acre. The proprietors of the other farm are using a 15/30 H.P. tractor of the same mark and operating with a 4-bottom 14 inch plough averaged 16 acres per day at a fuel cost of 99 cents per acre.

In is stated that tractors and tractor equipment for the cultivation of irrigated rice land has proved successful in the tropics, being used extensively in Indo-China and Siam. A Demonstration Station of 100 hectares (=247 acres) in Indo-China is being cultivated with the McCormick Deering machinery. The implements used are as follows :—

One 15/30 H.P. tractor said to be capable of working 200 hectares (494 acres).
One 10 ft. Tandem disc-harrow.
One 9 ft. Harrow-plough.
One 10 ft. Tractor power-lift seed drill.
A Martin Ditcher was used for making the bunds but a certain part of this work was done by hand.

The 100 hectares was harrow-ploughed in 9 days and disc-harrowed in 10 days, which equals 27.47 and 24.7 acres per day for ploughing and harrowing respectively. The extra day taken to disc-harrow the land was attributed to slipping of the tractor wheels on the soft soil. A few days after the first cultivation, one half of the area was again disc-harrowed and the other half re-ploughed with the harrow-plough, which made a perfect seed bed on part of which seeds were drilled and on the other part broadcasted by hand for comparison. The results of this experiment, together with costs are not yet known.

The machinery required to work an area of 500 acres is stated to be : One 15/30 H.P. tractor, one 9 feet harrow-plough, one 10 feet tandom disc-harrow, one drag harrow, one 10 feet double gang soil pulveriser, one 10 feet power lift seed drill, one 8 feet rice binder and one 23 x 28 inch rice thresher. The cost of this machinery including packing, but not freight to destination, is approximately $6,325/- (Straits Currency). If a broad-cast seeder instead of a seed drill is obtained the above amount can be reduced by $263/-

In Malaya, tractors have been used with varying success during the last decade for drawing cultivating machinery on rubber and coconut estates . The success or otherwise of the tractors depended to a large extent on the implements used and the type of land cultivated. When used with the disc-harrow, tractors were almost invariably satisfactory, but with a mould board plough they were only successful when the land was comparatively free from buried stumps and timber. The amount of work done with ploughs varied between three and five acres per day and disc harrowing between fourteen and twenty acres per

day. Costs varied between $4.50 and $6/- per acre for ploughing and 75 cents to $2.30 for disc harrowing.

At the Government Experimental Plantation, Serdang, where Cletrac tractors with Oliver one and two furrow ploughs and a disc harrow were employed in cultivating newly opened land, the costs per working hour taken from data collected over three years are as follows :—

Driver's wages	$0.17
Coolies wages	0.05
Kerosene (1 Gall. per hour)	0.75
Petrol .101 Gall. per hour @ $1/-	0.10
B. B. oil 0.067 Gall. per hour @ $3/-	0.20
Gear oil .018 Gall. per hour @ $2.15	0.04
Spare parts and repairs	0.42
	$1.73 per hour.

The above figures are calculated on the hours the tractor worked, no account being taken of time lost for repairs or owing to wet weather. The cost of ploughing newly opened clean cleared land varied between $6/- and $15 per acre depending on the condition of the land. The tractor was often stopped by obstacles in the ground and the negotiation of soft spots where it sunk and had to be extricated thereby wasting time and adding to the cost.

The cost of ploughing land that had already been cultivated averaged $5.50 per acre, while disc-harrowing cost from 71 cents to $1.86 per acre.

A Fordson tractor was used in Malacca in 1922 for opening up "lallang" grass land for the cultivation of padi. Although quite successful it was found to be more expensive than bullocks due to the land not having been tilled previously, the drivers being unused to the work, and the small size of the land divisions. The land was ploughed at the rate of 2.9 acres per day of 8 hours at a calculated cost of $11.50 per acre. Harrowing and cross-harrowing cost, for the two operations, $2.30 per acre. A Cletrac tractor was afterwards used and the costs were much the same as when the Fordson was employed. Both tractors sunk into the ground on soft land.

The cultivation of rice land by means of a tractor and implements has been carried out recently at Pulau Gadong Padi Station in Malacca by Mr. Newman, Agricultural Field Officer, Malacca. The implements used were a Fordson Tractor, an Oliver 2 share plough and a John Deer two-gang 14 disc harrow.

The cultivation was of dry land, ploughing to a depth of about 4 inches and afterwards disc harrowed to produce a fine tilth.

The work was quite satisfactory, but as the area was only just over 3½ acres divided into plots of 1¾, ¼ and approximately 1 acre, each, cultivated separately, the amount of work performed per hour was less than on large areas. The area

ploughed per hour was 5/6 acre and disc-harrowing at the rate of 2¼ to 2½ acres per hour at a cost of approximately $1.20 and 5 cents per acre respectively for fuel, lubricating oil and driver's wages.

Cost of Production.

Without experience it is difficult to estimate the cost of production as there are so many factors to be considered, not the least being the capital cost of the machines. This will depend largely on the condition of the land to be opened and the difficulties to be overcome with regard to irrigation and drainage. Newman working in Malacca has estimated that the costs of production on a large scale farm of 800 acres including management, depreciation on implements, machinery and buildings capitalised at $140,000 to be $21.45 per acre. Tempany, Jack and Sands have estimated the costs of production, including management, in the neighbourhood of $20 per acre. Taking the higher figure and a crop of 300 gantangs of padi per acre at 13 cents per gantang, a profit of $17.50 per acre is obtained.

Summary and Conclusions.

The cultivation of rice by mechanical means has been carried out with success in different parts of the world, notably in the United States of America, parts of Southern Europe and to a small extent recently in Australia, Indo-China and Siam.

2. Tractors and modern machinery have not been used extensively in the cultivation of rice in the Eastern Tropics due to the fact that this crop is grown mainly by small-holders who cannot afford machinery.

3. Harvesting and threshing machines, similar to those used in temperate climates for other cereals, can be used for rice and special machines adapted to this crop are now made.

4. Where machinery is used in the cultivation of rice it is essential to have controlled irrigation and efficient drainage.

5. Water for irrigation is obtained either from higher levels by gravity or it is raised from rivers, streams or deep wells by means of powerful pumps.

6. The size and capacity of the pumping outfit will depend on the acreage to be irrigated, the height to which the water has to be lifted and the nature of the soil. The minimum capacity of the pump should not be less than one cubic foot per minute per acre.

7. Modern tractors are capable of operating all machinery on the farm, including pumps.

8. Without experience it is impossible to estimate accurately the cost of production as this will vary with the condition of the land to be opened. Given favourable conditions, however, it has been estimated that the cost will be between $20 and $25 per acre.

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THE RURAL LECTURE CARAVAN

BY

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The project of putting on the road a travelling cinema and propaganda caravan to be run jointly by the Co-operative Department, the Department of Agriculture and the Rubber Research Institute of Malaya was described in an article appearing in the number of this journal published in February, 1930. In that month, financial provision was made by Government and by the Board of the Rubber Research Institute for this purpose. The sum voted was divided into two parts —a portion being allotted for capital expenditure and the balance for annually recurrent expenditure on film propaganda and running costs. A joint Committee consisting of the Directors of Agriculture and Co-operation and the Director of the Rubber Research Institute was formed to supervise and co-relate activities in connection with the venture.

There was no precendent in Malaya for the building of a caravan of the type required and little or no data to work on. Much preliminary investigation had to be undertaken. The Committee obtained the best advice available locally and in Madras on the subject of the construction of the van and of a trailer. The services of the Acting Instructor of the Government Trade School at Sentul were availed of to prepare specifications and generally to supervise construction on behalf of the joint Departments.

After consultation, it was decided that the body work of the caravan could be constructed by the Carriage Department of the F.M.S. Railways, and the necessary authority was obtained. Construction was started on 8th. August, 1930, and so rapidly did it progress that the caravan was given its first field test on 19th. November, 1930. Subsequently, as described below, it has been extensively employed.

In drawing up specifications for a vehicle of this description it had to be borne in mind that a very large and varied amount of material, varying from a teaspoon to a cinema projector had to be carried; that disposable space was very limited and the comfort of the driver and lecturers had to be studied. It was necessary firstly to consider the materials to be carried and secondly, to make provision for every article in a properly designed compartment.

The body framework is of seasoned Chengai wood, built on a Morris 30 cwts. lorry chassis. The roof is of domed design. The exterior panelling is of aluminium sheeting, spray painted royal blue below and ivory above, with a

The Rural Lecture Van Organised by The Department of Agriculture, Co-operative Department and Rubber Research Institute of Malaya.

A Lecture and Demonstration Given in a Village School During a Tour of The Rural Lecture Van.

"duco" finish. On each side appears the F.M.S. Coat of Arms. There are two ventilators in the roof and a chimney above the cooking stove. It is interesting to record that the ventilators, which were made by Chinese craftsmen, are miniature replicas of similar ventilators on F.M.S. Railway carriages.

Behind the driver's cab the body is divided into two compartments. A small sliding shutter is provided in the bulkhead between the cab and the inner compartment so that the lecturers can speak to the driver when necessary.

This front compartment is intended for living quarters for two Malay lecturers. Upholstered sleeping berths are provided on each side. By day these berths form seats when the caravan is travelling from place to place. Drawers, some in tiers, are provided under the berths for the accommodation of officers' clothing. The windows are of "triplex" glass raised or lowered by revolving handles. Detachable mosquito frames for the windows are carried. A folding, oval wash-hand basin is fitted centrally on the bulkhead next the driver's cab, with a drain through the floor. The basin is fitted with a tap and tank on the partition with a capacity of about 4 gallons. On the tank a mirror and clock are provided and there are several conveniences in the way of shelves, brackets and coat-hangers.

The rear compartment has, on the right-hand side, two large cupboards. That nearest the inner partition is zinc-lined and serves as an ice chest. The other cupboard, nearest the rear, contains cooking utensils, kettle, and jars and containers for such necessities as rice, tea, sugar and coffee. Above is a zinc covered table top to which is clamped a "blue flame" oil stove of the "Dangler" type.

The left hand side is fitted with a large cupboard divided into suitable compartments of correct size to accommodate cinema projector, dynamo and other articles. Above the cupboard are several drawers, one with partitions for carrying canisters of Cine-Kodak films, another for spare projector bulbs, electric torches, battery cells, and another for crockery. To the right is a recess in which a small, folding table is carried, and a pigeon hole, the outside portion of which forms a zinc drip tray with outflow plug under the cock of the water tank. Above the drawers again is a shelf with a coaming for odd articles. To the right of the drawers is a drinking water tank fitted with a nickel plated tap.

The entrance to the body is by a door centrally situated at the rear, the lower half panelled and the upper half fitted with a fixed "triplex" glass window.

The interior of the lorry: drawers, cabinets, lockers and cupboards are of walnut, fine finished and polished. All hinges, locks, bolts, clips, coat hooks, clamps and other metal fittings are of strong, solid manufacture, brass and nickel-plated. As far as practicable, the kitchen fittings are white enamelled.

Two petrol-pressure mantle storm lanterns are carried. These have not been altogether satisfactory and it is proposed to replace them by an electric light installation, providing at the same time a small fan in the inner compartment.

The power unit for the Cine-Kodak projector is interesting. It consists of a Bell and Howell's 1000 watt. generator driven by a leather belt running round

the " jacked " up, off, rear wheel. A suitable bracket for the dynamo is clamped on the offside footboard near the wheel. When the generator is in use, a portable switch-board fitted with pilot lamp, ammeter and voltmeter, main switch and plug and a length of flexible wire, connecting plug to projector, is placed on the footboard. A steady voltage of 120 is easily obtained. The total mileage covered to date amounts to 2015. The estimated mileage per hour of film is 15. The petrol consumption is between 14 to 15 miles per gallon.

The chauffeur of the caravan, who is also responsible for the power unit, is a Malay selected from the Government Trade School, with three years' training as a fitter and electrician.

On the front of the caravan, above the driver's cab, is painted in Arabic characters the inscription " Suloh Kemajuan Kehidupan Kampong " which might be rendered " the torch of rural prosperity ". The same inscription also appears in the centre of the rear of the caravan. Outwardly, the caravan presents a distinctive, "stream line" appearance and is a credit to the supervisors and craftsmen of the Railway Workshops. The trailer has not yet been built.

The main purpose of the caravan is to give demonstrations to Malays and Indians on agricultural and co-operative subjects, by means of lectures, displays of exhibits, lantern slides and cinematograph films.

The caravan is under the joint control of the Department of Agriculture, the Rubber Research Institute of Malaya and the Co-operative Societies Department. It carries a staff of two or three Asiatic officers of the above mentioned departments who are responsible for carrying out the programme of each tour. A European officer of the Co-operative Societies Department has hitherto accompanied the caravan during the initial tours. In future, however, it is intended that the caravan shall be subject to the general supervision of the Agricultural Field Officer in charge of the area covered by the tour.

The first occasion that the caravan was operated was at Dusun Tua in Selangor on the 19th. November, 1930. This was followed by a brief tour in the Klang and Kuala Selangor Districts of Selangor at which an incomplete programme was followed.

Subsequently, two complete tours of about a fortnight each have been undertaken, the first in the Ulu Langat District of Selangor in January and the second in the western portion of the Negri Sembilan during March, 1931.

The site selected for a demonstration has usually been the compound of a large Malay school. While the exhibits were displayed in the school, the remainder of the programme was carried out in the open when weather conditions permitted.

A typical day's programme was somewhat as follows :—The journey from one centre to the next was made in the course of the morning. On arrival at the new centre, the necessary preparations were made for the afternoon and evening demonstrations. About 4.30 p.m. a lecture on the subject of padi cultivation and its pests was delivered with the aid of exhibits. Such lectures and demonstrations proved most interesting and the specimens were closely inspected by the Malay

audience, many of whom brought books in which they made notes on the exhibits, more especially on the specimens of pedigree padi. In the Negri Sembilan a number of orders were subsequently received for supplies of pure strain padi for planting.

Twelve such lectures on the cultivation of rice were delivered by the Malay officer of the Department of Agriculture on duty with the van. The total number of persons attending was 2,200, including local headmen, chiefs and other prominent members of the local communities.

After an interval for the evening meal at about 7 p.m. a lecture on Mouldy Rot Disease of rubber and its treatment was delivered illustrated by lantern slides and a wall diagram. This lecture was delivered on fourteen occasions to a total attendance of 8,600 Malays.

Following the above lecture, the Malay film prepared by the Co-operative Societies Department entitled "Thrift Versus Extravagance" was screened. The pictures were closely followed by the audience and it is evident that they were understood and appreciated. This film has now been shewn to audiences amounting to 13,800 Malays.

The caravan has also visited a number of rubber estates where the Indian co-operative film "Muniandi and Kuppan" has been shewn seventeen times to a total of 6,600 Indian labourers.

In the light of experience gained, a full programme of tours in other parts of the Federated Malay States and Straits Settlements is being arranged for the remainder of the year.

It is premature at present to estimate the educational value of these tours, but it is evident that the demonstrations have attracted large audiences and aroused considerable interest among the rural population for whose benefit they are designed.

The three departments responsible for these tours wish to acknowledge the material assistance received from the Education Department and the F.M.S. Police.

LIFE CYCLE OF A FLY PEST (ANTHOMYIID),* ON *NIPAH FRUTICANS*

BY

J. W. Sewill, M.A. (Cantab.) A.I.C.

Owing to the difficulty in obtaining a supply of fresh male nipah flowers near Kuala Lumpur, Mr. G. H. Corbett, Government Entomologist, S.S. and F.M.S., suggested that the writer should endeavour to ascertain the life cycle of this insect.

Method. Since practically every spathe is infested with eggs and maggots in all stages of development, care had to be taken not to confuse generations. In each case the eggs were collected immediately after being deposited by a female actually under observation. They were placed in a plugged tube and on hatching, supplied every day with fresh food. Each male inflorescence so used was cleaned of all other eggs and maggots. The maggots were continually transferred to fresh flowers until they were full-grown, when they were removed from the tube and placed in a cage on dry earth to pupate.

Eggs. These are cream coloured, torpedo shaped bodies, with fairly resistant skins, about 2 mm. long. They were laid in groups of twenty or more, resembling cartridges in a belt, under the sheath of the unopened male inflorescences. As the flies failed to breed in captivity, the method of depositing the eggs was somewhat of a puzzle since the sheath fits very closely round a pair of male flowers. Careful observation of a group of flies on a palm in the field showed that the females stand at right angles to, and with their backs toward the edge of the sheath. By means of a long telescopic tube-like ovipositor they force the eggs, which could actually be seen passing down the ovipositor, under the edge of the sheath. The ovipositor appeared at first sight to be the extroverted cloaca but by chance a female was observed with the tube extended which had been seized by a dozen small ants. This fly was killed and the abdomen opened under a microscope. The cavity was crammed with eggs.

Eggs. (x3).

The ovipositor was now seen to be truly telescopic in three segments. The distal segment is certainly chitinous and provided with a few stout hairs, which no doubt assist in the penetration of the flower sheath. The middle section is a mass of retractile longitudinal muscle bundles. The integument, which is quite transparent, is closely studded with short thornlike hairs. Near the base are two long stiff dark hairs and two yellowish transparent bodies resembling tubes. The proximal segment is provided with muscle bundles ending in the

* This insect has recently been described by Malloch as *Phaonia corbetti* in "The Annals and Magazine of Natural History" Vol. 7, No. 38. from material obtained from the male flowers of the nipah palm in April, 1928. *G.H.C.*

abdominal wall, behind which lies a dark brown sac-like object which may receive the retracted tube.

On one occasion, a fly appeared to lay its eggs in a partially open male flower, but subsequent dissection and examination proved negative, as did further examination of a number of flowers. The period of incubation is 24 hours.

Maggot. The maggots when hatched bore into the male flowers and then feed down inside the stem which they destroy, in some cases entirely with the exception of fibrous tissue. Maggots in captivity whose food was not changed, lived in stems which were rotten and showed no great desire to migrate to fresh stems when offered. There are usually two or three male flowers with very short stems surrounding the female inflorescence and, as they seem almost invariably to open before the male with long stems originating much farther down the female stem, naturally attract the flies. The short stemmed male flowers are the most dangerous since the maggots rapidly eat their way down into the female stem resulting in the death of the young fruit. The male flowers with long stems are not such a menace, as the maggots, having a long way to travel, may not reach the stem of the female flower. A full-grown maggot is browny white and about 15 mm. in length. The larval period lasts about 10 days.

Maggot (x4.)

Pupa. The maggots usually pupate just beneath the surface of the earth but in some cases pupae have been found embedded in the long male stems. In the case of a palm surrounded by water, pupation would probably normally occur in the flower stem.

The pupa is about 8 mm. long, dark brown and with an eight segmented body resembling a small chrysalis. The pupal period lasts 10 days.

Flies. These closely resemble the house fly but are appreciably larger. Some are distinctly larger than others, but males and females have not been definitely identified here.

In captivity they appear to feed on pollen, but none lived long enough to give definite evidence. As remarked previously, they have so far in isolation failed to breed.

The life cycle may thus be summarised :—

Egg—Maggot	...	...	1 day
Maggot—Pupa	...	...	10 days
Pupa—Adult	...	...	10 days
Total		...	21 days

Fly (x5.)

Enemies. The flowers are aften surrounded by spider's webs and there is no doubt that these are natural enemies of the flies and act as a check on them. Owing to the remarkable protection offered by the tight sheath under which the

eggs are laid there is probably a high percentage of hatchings. Ants have, however, been observed carrying off not only eggs but newly emerged maggots.

Control. The cutting off of all male flowers, after artificially cross pollinating the female flowers, seems to be a perfectly simple and a safe means of controlling this pest.

The length of life of the maggots gives ample time for control measures to be successfully pursued with the proviso that the short-stemmed male flowers immediately surrounding the female inflorescence are removed at the earliest possible moment. The stems are often only 1—2 inches long and a mass of maggots can be seen at their base starting to feed on the female flower stem, which at an early stage is quite soft and not covered with the hard brownish skin like varnish which it later acquires.

Miscellaneous Articles.

SIXTH REPORT ON NATIVE RUBBER CULTIVATION *

The following is a translation of the "Sixth Report on Native Rubber Cultivation" in the Netherland East Indies. The report covers the period from September, 1930 to March 18th, 1931. It was prepared by Mr. A. Luytges, Chief of the Division of Agricultural Economics of the Agricultural Information Service, Department of Agriculture, Industry and Commerce.

The marked decline in rubber prices during the first eight months of 1930 continued since the middle of September but to a less degree. The lowest point was reached on October 1 and 2, when Java Standard crepe was quoted at Batavia at the rate of 18 cents per ½ kilo. This was followed by a price recovery up to 22, and 23 cents and here prices remained stable up to the middle of December. Since then, prices have been hovering at about 20 cents.

As predicted in the foregoing report, the price decline caused a considerable decrease in exports. Thus, in September, the exports of dry rubber totalled 5,248 metric tons; in October 4,442 tons; in November 5,792 tons; and in December 6,364 tons. These figures compare with the 1929 monthly average of 8,964 tons. The reduction in exports was universally caused by a decrease in production, many producers considering the prices not sufficiently profitable to justify further tapping. Some of the producers increased their stocks but this movement was not on a large scale.

The abnormally low exports of September and October must be explained as a direct result of the influence of the price fall on the interior markets. These markets react strongly to price fluctuations in proportion to the distance they are situated from Singapore, the most important rubber market. These markets react to stabilization of the world price level after a sharp decline by an increase of the price when the normal balance with the world market is re-established. Early in October, prices on the local markets of Palembang and Djambi fell to 8, 7 and even 6 cents per kilo for so-called "basah-kring" or one week old rubber. In the beginning of November, prices had increased again to 10 and 11 cents, while in the latter part of November prices of 14 and 15 cents were quoted here and there. On the other hand, blanket quotations at Singapore showed only a fluctuation from the lowest point in early October, which was 10 Straits cents per pound. From this point, prices rose to 11½ Straits cents in early November to 13 Straits cents at the end of November. This marked local price movement explains to a large extent the recovery in exports after the noticeable price decline. The creation of stocks undoubtedly also played a part in this connection. A similar course of events has been noted several times during recent years.

* We are indebted to His Majesty's Consul-General, Batavia for preparing and forwarding the translation of this important article.

In view of the gradually falling prices in December, 1930 and January, 1931, the high exports in January caused considerable surprise in many quarters. These exports amounted to 7,974 tons of dry rubber and the fact that they showed an appreciable rise over previous monthly exports may not be explained entirely by the price situation on the home markets. The January exports bring into the foreground once again the more or less uncertain element in native rubber production. We will refer to this again.

Table I in the attached appendix * gives a survey of the regional monthly exports calculated on the basis of the figures published by the Central Statistical Bureau in Maanstatistiek No. 9. These figures have only a provisional character.

Table II shows the total regional exports, divided into the three quality groups selected for the purpose of assessing the export duty. In addition, the export to Java has also been taken into account, as well as the export from Tapanoeli, on which no export duty is paid, and also the export from the free port district of the Riouw Archipelago and its Dependencies.

In view of the remarks made in the beginning of this report and the explanations made in the foregoing report, it is believed that these tables do not call for much comment. We will discuss only the changes in the dry weight percentages.

In Tapanoeli, Sumatra, West Coast, Palembang, Djambi and Acheen, the dry weight percentage has increased. For the first two regions, we must look for the cause to the fact that practically only prepared (therefore dry) rubber is still being exported because transportation charges for wet rubber from the interior are very high. With regard to Palembang and Djambi, the cause for the increase in the dry weight percentage laid in the fact that while exports of dry rubber (Group I) increased during 1930, the total exports dropped somewhat. The exports listed under Group I increased from 2,433 tons in 1929 to 3,098 tons in 1930 in the case of Palembang and from 2,558 to 2,778 tons in the case of Djambi. These increases in dry rubber exports are due to the rubber processing activities of the Netherlands Rubber Union, Ltd., with factories at Palembang and Djambi. In addition, the rubber processing factory of the Internationale Crediet—en Handels—vereeniging "Rotterdam" (Internatio) at Palembang continued its operations during 1930. The total export of Acheen decreased during 1930 against 1929, although the export of prepared rubber remained practically unchanged. In the Sumatra East Coast, Riouw Archipelago and Banka, the dry weight percentage remained almost the same. In the Western and Southwest Divisions of Borneo, however, it decreased, and especially in the Western Division. This is the result of decreased dry rubber exports, which amounted in 1929 and 1930 for the Western Division to 6,269 tons and 5,707 tons and for the Western Division to 6,269 tons and 5,707 tons

* The appendices were not forwarded with the translation. We were also not informed of the publication in which this article originally appeared. Previous articles of this nature were published in the Dutch official publication, *Korte Berichten,* and we imagine that the present article emanated from the same source.—*Ed. M.A.J.*

and for the Southern and Eastern Division to 7,433 and 5,874 tons respectively.

The total dry rubber exports (Group I), which have steadily increased in recent years, amounted to only 22,391 tons in 1930 compared with 24,097 tons in 1929. With regard to the percentage of total exports, calculated into dry equivalent, however, the exports of dry rubber showed a relative increase, namely from 20.3 per cent. in 1928, 22.2 per cent. in 1929 to 24.7 per cent. in 1930.

An examination of graph I based on Table I will show that in 1930 exports of native rubber followed price fluctuations closely. The decrease in prices in London below 7 pence made the export decrease considerably. The export of 1930 was much lower than that of 1928 and compared with 1929 there is a decrease in exports of 16.7 per cent. If we take into account the fact that the potential production should normally increase strongly from 1930 on because the large planted extensions of the years 1924—27 will by that time have reached tapping age, then we come to the conclusion that the export and therefore also the production in 1930 decreased relatively far more than the export figures show. This may be seen from the following table, in which potential production is based on very general estimates.

Year.	Potential production in tons—dry.	Actual production (export in tons—dry).	Actual production of potential production.	Average annual Batavia quotations of standard-crepe in cts. per ½ K.G.
1927	100,000	100,491	100 per cent.	99
1928	110,000	91,353	83 ,,	58½
1929	120,000	108,584	90 ,,	54
1930	150,000	90,096	60 ,,	30¾
1931	200,000	.....	.....	.....
1932	250,000	.....	.....	.....
1933	300,000	.....	.....	.....

It is interesting to compare the relative decreases in exports of native rubber from the Netherland East Indies with exports from other groups of producers and in other countries. In making comparisons, it must be remembered that the 1930 figures used in this report are based on the monthly reports and are tentative, pending publication of the final 1930 statistics. In the following table,

only the native rubber exports to foreign countries have been taken into account as reported in the monthly statistics. The export from British Malaya has been reduced and calculated into dry weight.

	Export in metric tons.			Difference in per cent. from 1929.
	1929	1930	Difference.	
British Malaya ...	459,331	447,628	— 11,703	— 2.5 per cent.
Ceylon	89,564	83,853	— 5,711	— 6.4 „
Netherland India: ... of which ...	258,406	243,678	— 14,728	— 5.7 „
Estate-rubber ...	150,849	154,758	+ 3,909	+ 2.6 „
Native-rubber ...	107,557	88,920	— 18,637	— 17.3 „

This table shows that the unfavourable market situation has especially affected the production of native rubber in the Netherland East Indies. This is easily understood inasmuch as native production stops when prices are not sufficiently high to avoid losses. It is remarkable, however, that estate rubber cultivation in this country shows a slightly larger export in 1930 compared with 1929 and this in spite of the cessation of tapping operations during May. This increased estate production must be credited to the tapping of new trees and the increased production per hectare.

It is probable that the estate cultivation in Malaya has not had a smaller production and therefore the decreased export must be credited to a smaller production on the part of native smallholders. As is shown by the figures, the decrease of Malaya is smaller than of the whole of Netherland India. From this it may be deducted that the production of the small-holdings in Malaya has been influenced probably less by the price fall than the native cultivation in this country. The causes for this difference will have to be looked for in the fact that, because of the nearness of Singapore, the greatest rubber market, and the application of another method of preparation (Chinese smoked sheet) the small-holdings of Malaya are in a more favourable production position. They form far more independent small concerns than our native rubber cultivation which is almost always run as a secondary cultivation alongside the cultivation of food products.

Previous reports have already considered the great changes which have taken place during recent years with regard to the native rubber cultivation and the increasingly difficult situation for rubber. These changes may be summed up as follows;

At the time of the boom period of 1924—27, the native population in the rubber districts was not much inclined to work, since by employing imported tappers they still were able to draw large incomes from their gardens. The continued price fall since 1927 made it unprofitable to employ imported tappers and by the second half of 1928 they had almost disappeared. Lack of funds in the interior forced the population to take charge of the tapping directly, this being done especially by the holders of small gardens. The number of such holders increased considerably in the late years because of the coming into tapping of the plantings since 1924. In the typical rubber districts, it may be said that nearly every family is in possession of one or sometimes more rubber gardens ready for tapping. It needs no further explanation than this to point out that this new position offers increasing possibilities for using local labour than was the case before.

Meanwhile prices fell to a level at which it became difficult for the larger native garden owners to obtain coolies. The former "bagi-dua" system went more and more out of use, while in part of the larger gardens production was stopped. Thus the rubber production came ever more into the hands of the owners of the small gardens.

The continued price decline in 1930 finally reached such a low level that in several districts, especially in those situated far away from the important export centres, tapping grew to be unattractive even to the small holder. Many stopped tapping with the result that the export decreased considerably.

The price recovery, as aforementioned, especially on the interior markets, stimulated production again towards the end of the year although there were other factors which also contributed to increased production during these last months. Among them undoubtedly the most important is the fact that the native population has adjusted itself to a lower standard of living brought about by lower prices in the rural districts for the necessities of life and especially of such imported items as piece-goods. In view of the lower prices for articles which the native population desires to purchase, it is now quite satisfied with present returns from the rubber cultivation which during previous years and even in the beginning of 1930 were considered insufficient for the exploitation of the gardens. By chance tests made during personal investigations carried on in Palembang, Djambi and the Sumatra East Coast, it was found that prices for the necessities of life in the rural districts have decreased strongly in recent years but especially in 1930, percentages of decrease being mentioned of from 30 per cent. to 40 per cent. and even to 50 per cent.

In view of these price decreases, it is remarkable that in a few districts tapping by local "bagi-dua" tappers, or those from the near vicinity, has started again, although the daily wage is only from 20 to 30 guilder cents and sometimes even less.

Another factor which has led to increased exports and which has undoubtedly affected the rubber export in January is the matter of paying the taxes and the so-called "road-money," the latter being a tax levied in lieu of personal

labour on certain highways constructed particularly in the Outer Possessions. The natives had to produce cash and to get cash they tap their rubber trees, produce other export products or secure jungle produce. Rubber is the article to be considered first since it may be obtained readily and without much exertion.

The "Puasa" month and the "Lebaran" (Mohammedan holidays in February) again stimulated this demand for cash and must have been one of the causes for the increased tapping and selling of stock, which led to the high exports, especially in January. In this connection, it is also announced from Palembang that much coffee from the stored stocks has also been sold. Summing up the foregoing discussion, we may say that the increase of native rubber exports since October, 1930, may be credited to the following set of factors:

(1) A slight recovery of the world market, acting in the interior as a rather important price recovery.
(2) The demand for cash for the payment of taxes and "road-money" for which purpose old stock was sold in addition to the larger production.
(3) The marked demand for cash in the "Puasa" and for the "Lebaran."
(4) The decrease in prices for the necessities of life in the interior regions. Natives are now satisfied with lower returns.
(5) The strong increase of the potential production of the native rubber cultivation because of the coming into bearing and the increase of the productivity of the large areas of young plantings which were laid out during the rubber boom from 1924—27 inclusive.

This complicated set of factors makes it almost impossible to make any accurate predictions with regard to the production of native rubber for the next few months at the price level of 20 guilder cents per half kilo. When the factor No.3—the native holidays—drops away, the others remain of influence except perhaps the continuation of the fall of the standard of living about which very little is to be said.

As to the economical position of the population of the rubber districts, it may be pointed out that now, as a result of the general extension of the cultivation of foodstuffs, sufficient food is available everywhere. In contrast to this favourable position, there is on the other hand in many places a rather serious lack of cash which finds its expression among other things in the arrears of taxes. In this matter, it is a favourable factor that most imported articles have decreased markedly in price thus making the scarcity of money not so serious.

Buitenzorg, March 18th, 1931.

Later Comments.

Mr. Luytges supplements his foregoing report on the basis of later data secured from various producing centres. The translation continues:—

Upon request the officers of the agricultural information service in the most important rubber districts expressed their opinion about the increase of the export in January. Summed up, the causes were:

1. *Djambi*—(a) Obligation to pay taxes;
   (b) Demand for money during the Puasa and to celebrate the Lebaran.
2. *Western Division of Borneo*—(a) Reaction to the higher prices in November and December; (b) Demand for cash.
3. *Palembang*—(a) The Puasa; (b) Strict collecting of money for relief from compulsory labour and taxes together with a scarcity of money.
4. *Southern and Eastern Division of Borneo.*—More demand for money because of the Puasa; (b) In many districts the rubber cultivation is the most important source of money income.

Since closing the foregoing report, the provisional figures for the March export of native rubber have become available. There has also been a considerable fall in prices on the rubber market. These facts give cause for a few minor changes in the proof of the report and for writing up the following supplement.

On the March export figures of native rubber, the cabled statements from the custom houses at Djambi, Palembang, Bandjermasin, Pontianak and Sambas are available. For the months of January, February and March they were as follows:

Export, Native Rubber, Not Reckoned by Dry Weight

(in tons of 1,000 kilos)

		January	*February*	*March*
Djambi	...	2,840	2,243	2,679
Palembang	...	1,389	1,460	1,776
Bandjermasin	...	1,450	1,090	1,447
Pontianak	...	1,766	1,408	2,053
Sambas	...	437	427	618
		7,882	6,628	8,573

The total export of native rubber calculated into dry weight in January was 7,974 metric tons. Assuming that the ratio of the rubber exports in the above-mentioned three months is equal to the ratio between the totals of the cabled statements, then it appears that the total export of native rubber calculated into dry weight must have been about 6,700 tons in February and about 8,700 tons in March.

With the exception of February, which was three days shorter than either of the other two months, it is seen that the export, notwithstanding the fact that a balanced position between the local and foreign price level must have been established, has a rising tendency, for which in the main the heavy increase of potential production and the low living standard in the interior must be considered to be responsible.

The new price fall of rubber, (the product now having reached the level of about 16 guilder cents per ½ K.G. standard Batavia), will probably result in a new decrease in the export of native rubber, and this again in the first place because of the increased influence of the price fall in the interior; but also because, as explained in the Fifth Report, native rubber will be almost valueless at a price of about 12 guilder cents per ½ kilo standard Batavia. At present, every price fall is in percentage far heavier for the native rubber than for the standard product.

The question arises whether at this low price level the estates will also contribute to a recovery of the market by reducing the total production.

Buitenzorg, April 4th, 1931.

CONDITIONS ON SMALL RUBBER HOLDINGS IN MALAYA.

First Quarter, 1931.

The Weather.—With the exception of Northern Kedah which was dry, the normal wet weather of the north east monsoon season continued in most parts of the Peninsula until the middle of January, but in Pahang it lasted until the end of the month and caused a severe flood in the eastern half of the Pahang river area. A spell of unusually hot dry weather followed, broken by occasional and local heavy showers which became more frequent in some districts towards the close of the quarter.

Prices.—The following table shows the general range of local prices reported to have been offered for rubber from small holdings in cents per kati. The corresponding price in cents per lb. has been calculated for comparison with the Singapore price for standard smoked sheet.

MONTH.	SINGAPORE PRICE. STANDARD SMOKED SHEET.		LOCAL PRICES. SMALL HOLDINGS RUBBER.			
			SMOKED SHEET.		UNSMOKED SHEET.	
	Cents per lb. Range.	Cents per lb. Average.	Cts. per kati.	Cts. per lb.	Cts. per kati.	Cts. per lb.
January ...	11⅞-13½	12.8	12-17	9-12.75	9-15	6.75-11.25
February ...	11⅜-12	11.9	10-15	7.50-11.25	8-13.50	6-10.13
March ...	10¾-13⅜	12	11-17	8.25-12.75	8-14	6-10.50

In addition there is a market for scrap and lump rubber at average prices of about 4 to 5 cents a kati. The prices vary in different districts from as low as 1.50—2 cents up to as high as 6 to 8 cents a kati.

The reports show considerable range each month in the local prices for rubber from small holdings. Several factors have an effect on local prices among them may be mentioned:

(*a*) quality of the bulk of the local rubber;
(*b*) distance from a central market;
(*c*) speculation among local small rubber dealers;
(*d*) the amount of competition in the local buying centre.

During February buyers were able to take temporary advantage of the anxiety of small holders to sell, in order to obtain cash for the Mohamedan and Chinese New Year holidays, and so to depress the local prices below the normal rates indicated by the Singapore price.

General.—Wintering commenced at the end of January and continued throughout the dry weather in February and March. At the end of the quarter

it was practically completed and the flush of new leaves was developing, except in Singapore island where leaf fall was late. The leaf fall was by no means so simultaneous throughout the country, so uniform in each locality or so heavy as in 1930.

Another factor liable to influence rubber production during the quarter is that in most parts of the country small holders were busy reaping the padi harvest and in consequence, where tapping coolies are no longer employed, the trees are liable to have been left untapped.

Owing to large crops in other parts of the world, notably Burma, the price of rice is unusually low. This is an advantage to all small holders, except those in the large padi growing areas such as Krian and Kedah who are, at least in part, dependant on the sale of their surplus padi.

There is a tendency among Malay small holders to take an interest in crops other than rubber more especially food stuffs, such as hill padi, maize and tapioca. Considerable areas of such crops have been planted in parts of Pahang and in Kedah.

Upkeep of Holdings.—In Selangor the general upkeep of small holdings is still neglected. In Pahang West during the dry weather some holdings were cleaned up by those owners who could afford to do so. This work usually took the form of strip-weeding which had the added advantage of preventing soil erosion in the hilly parts of the State. In Singapore island it was noticed with some surprise, that during March expenditure was incurred by owners of certain small holdings and small estates on eradicating lalang grass and bush. The reason for this change in policy is not understood.

Tapping. It was reported that in Pahang West during January the wet weather and the continued low price of rubber combined to cause a further increase in the number of untapped holdings during the month. In Singapore island during the same month a large percentage of small holdings remained untapped. It has, however, been noticed that with any slight rise in price tapping is temporarily renewed on a few of the holdings, but is stopped as soon as the price again falls. Conditions in Singapore island showed no change during the quarter.

It was noticed in Pahang West during February that a considerable number of Chinese ceased tapping for a period of 7 to 10 days including the Chinese New Year, while it is recorded from Selangor in March that some of the larger Asiatic properties have temporarily gone out of tapping. On the other hand, in the Negri Sembilan during February tapping was resumed on many areas of small holdings on which it had been stopped some months previously.

According to comments from Selangor and Johore, tapping has continued to be severe, while in the latter State during March the trees were frequently tapped by lamp-light before day-break.

There are indications that in some other parts of the country, more especially where the owners are entirely dependant on rubber and own no padi land, tapping may be severe and the rate of bark removal excessive. Opinions at

present vary considerably as to the extent of such excessive bark removal and as to its effect on future production.

Yields.—In Pahang West during March it was recorded that the combined effects of wintering and the prolonged draught had considerably depressed yields.

Diseases.—(a) Mouldy Rot. The wet season, as usual, produced a vigorous recrudescence of Mouldy Rot Disease in all previously infected areas, while infection was conveyed to a considerable number of new centres by tappers dismissed from infected localities. It has been noticed on other occasions that the spread of the disease to previously unaffected areas occurs much more rapidly when low prices cause a number of tappers to move about the country in search of employment. During January and part of February control of Mouldy Rot called for careful attention, and necessitated the employment of additional temporary staff in Perak South and parts of Selangor. With the advent of drier weather the fungus became much less prevalent.

Arrangements have been made to establish a list of approved disinfectants for the treatment of this disease. Before inclusion in the list each preparation will be tested by the Rubber Research Institute, the cost of the test being borne by the manufacturers.

(b) Oidium leaf mildew. Minor outbreaks of Oidium disease causing abnormal leaf fall have been reported from a number of estates in various districts. In the districts on the Negri Sembilan—Malacca border and in Malacca, in which severe outbreaks occured on small holdings after the wintering season in 1930, only minor outbreaks have been observed this year. It is not anticipated that any control measures will be necessary owing to the mild attack and rapid recovery.

Budwood.—While imports of budwood, though decreasing, still continue, this budwood is not as yet used on small holdings. A few Malay and Chinese owners of small holdings are, however, interested in budding, as is evinced by the letters of enquiry regarding supplies of budwood and its correct use, which have been received both by the Rubber Research Institute of Malaya and the Department of Agriculture.

Reviews.

An Economic View of Rubber Planting.

BY

R. Soliva,

137 pp. Kelly and Walsh, Ltd., Singapore, 1931. Price $3.00 post free.

This brochure contains an interesting and valuable review of several aspects of the plantation rubber industry in the Netherlands East Indies, Ceylon and Malaya.

Although essentially, as stated in the title, the information is of an economic nature and deals with estate costs and yields, the author also discusses methods of cultivation, factory practice and methods of preparation.

The author makes fairly accurate statements and shows good powers of observations in most instances while in others the statements are somewhat inaccurate e.g. on page 14 he remarks that sandy soils for the cultivation of rubber should be avoided on account of the fact that they favour the spread of Fomes (lignosus) which is correct, while on page 13 he describes the coastal alluvial clays as containing a high percentage of sand. This certainly does not apply generally to the blue-grey coastal clays in Malaya on which rubber is planted.

Nor is his statement on page 15 that "the alluvial coastal districts are left to the Native" correct in relation to rubber cultivation, e.g. the large areas of alluvial soil in the Klang, Kuala Selangor, Kuala Langat districts of Selangor.

On page 15 the author also appears to suggest that the high yields of small holdings are due to the fact that they are planted on low lying land.

On page 17 the "dry season at the end of the year" should read "the dry season at the beginning of the year."

The information given on page 19 on budding is not very accurate in relation to the clones which are being used, while the figures of budded areas in Malaya are too low.

Under "Miscellaneous" on page 20, no mention is made of the preparation of concentrated latex known as Revertex which was commenced in Malaya long before the centrifugal process of concentration mentioned on the same page, (Reference is made on page 62 to the manufacture of Revertex on the R.C.M.A. Estates in Sumatra although this was commenced only recently), while the Spray Rubber Process has not been carried out in Malaya.

Again on page 21, the bark consumption on European estates in alternate daily tapping is given as 15-20 inches per annum which is far in excess of the amount removed by this system of tapping.

The section on costs per acre of bringing rubber into bearing may be taken as fairly reliable, but much will depend on the cost of labour.

While the cost of production figures per lb. of rubber given in Section VII for 1929 are fairly correct, the author has not realised how much these have been reduced during 1930.

Turning to the Section on the Netherlands East Indies the author's observations and remarks in relation to budded areas and areas planted with selected seed are of considerable interest and are probably accurate. They indicate that the areas planted with "proved" clones are not much in excess of the area already planted in Malaya, due to the fact that poorer yielding clones, since discarded, were planted by the pioneers.

It is doubtful whether the figures shewing higher costs of bringing rubber into bearing in Malaya compared with Sumatra as given on pages 72 and 73 are reliable, except that it has to be borne in mind that labour costs in Malaya on a dollar basis (2/4) compared with the florin (1/8) in the Netherlands East Indies must affect such costs, since the rates of pay of labour in cents (dollar) and cents (florin) are approximately similar. At any rate, some of the figures are open to considerable criticism.

Recent figures for cost of production in Malaya do not support the author's contentions on page 80 that cost of production is higher in Malaya than in Sumatra.

The reviewer has been shown recently a number of records of estate costs and has also discussed such costs with various authorities in Sumatra.

In relation to Ceylon the author makes no reference to the difference in tapping methods in Ceylon, compared with Malaya and the Netherlands East Indies. In Ceylon a very thin slice of bark per tapping is removed whereas in the other countries it is considered that such a practice decreases yields and is more liable to induce Brown Bast disease.

On page 93 the author refers to the milling of crepe rubber in Ceylon as being of a high standard. On most estates, however, in Ceylon, blanket crepe built up from a hot airdried lace crepe is manufactured and this does not require the fine milling which is essential in Malaya and Netherland East Indies for the manufacture of thin pale crepe. The finest crepe, as far as appearance is concerned, is undoubtedly prepared in Sumatra and Java.

The reviewer has not made the above criticisms in order to detract from the value of the book, which contains a vast amount of useful information in a small space. These criticisms would, however, have been unnecessary if the author had submitted his material to a few individuals or institutions to be edited.

The book can be recommended to all producers in the East and others who are interested in the plantation rubber industry in the countries with which the author deals.

The author in his preface craves the indulgence of the reader for technical errors, as he is a Banker and not a Planter. In spite of these technical errors, to some of which attention has been drawn in this review, the author shows that he possesses quite a good knowledge of the most important aspects of the industry and is capable of "appreciating the situation."

B. J. E.

Report on the work of Agricultural Research Institutes and on certain other Agricultural Investigations in the United Kingdom 1928—1929.

230 pp. Appendix and Index. London. H.M. Stationery Office Wyman and Sons Ltd., 1930.

Agricultural investigations conducted in temperate climates must, of necessity, have but a restricted application to tropical conditions. The summary of research work presented in this volume, compiled primarily for the information of the Council of the Ministry of Agriculture and Fisheries, London, might on these grounds be considered unsuited for review in a journal circulating in tropical countries and concerned with tropical crops and conditions. But there is much research work of a fundamental nature which finds its place in these Reports, and which is of value, not only to research workers, but to the practical agriculturist in the tropics.

Disregarding, therefore, the portions which deal with the conditions of growth and the diseases and pests of temperate crops, the volume still contains much that is of interest and value in tropical agriculture. We cannot, for instance, neglect the advances of science in relation to the breeding, diseases and physiology of cattle, although the information on feeding must be treated with greater caution when considering its application in a country such as Malaya. But even in cattle feeding, fundamental principles are evolved which must materially affect any preconceived ideas even under conditions widely dissimilar to those under which the actual experiments were conducted. We would instance the work of the Rowett Research Institute, Aberdeen, on the influence of minerals on the development and health of animals and that on nutrition and disease.

Turning for a moment to another aspect of agricultural practice; planters in the tropics cannot afford to ignore the valuable contributions to our knowledge on agricultural economics, and particularly to the application of the principles underlying this important branch of agriculture. The selection of methods of reducing costs of production and the degree to which such methods can be applied are of paramount importance at the present time. In this connection, the results achieved in the United Kingdom cannot be ignored by tropical agriculturists.

In soil research, mycology, entomology and in agricultural engineering much can also be applied to tropical conditions.

The reviewer is not attempting to offer an apology for the inclusion of this review on a book treating with temperate zone conditions of agriculture; still less does he wish it to be understood that the Reports to which he refers give the results of the scientific research of the United Kingdom during 1928 and 1929. For the most part, the publication refers to the lines of research conducted throughout the United Kingdom, from which the enquirer can readily get in touch with the particular institution concerned with any aspect of agricultural research. He will find much assistance from the Appendix and Index provided. The volume is therefore recommended as a book of reference which should assist agriculturists in keeping up-to-date in matters affecting their profession.

D. H. G.

The Behaviour and Diseases of Banana in Storage and Transport

BY

C. W. Wardlaw and L. P. McGuire.

67pp. 29 figs. Appendix and Index. Empire Marketing Board 36. January, 1931. London: His Majesty's Stationery Office. Price 1s. 0d. net.

The research dealt with in this publication was carried out by the authors at the Low Temperature Station, Imperial College of Agriculture, Trinidad, B.W.I.

Panama Disease, which first appeared in Central America in 1903 has caused heavy losses in the West Indies and has been responsible for the abandonment of thousands of acres of plantations. In view of the fact that the export of bananas from the British West Indies amounts to about £2,000,000 annually, the success of the research work indicated above is of great moment to the Empire.

The prevalence of Panama Disease, to which the Gros Michel banana, the chief variety of commerce, is susceptible has not only necessitated a study of the disease in question, but also the breeding of suitable immune or highly disease resistant hybrids and the selection of the most suitable varieties of proved immunity or high resistance. In addition it has been necessary to determine the precise set of conditions suitable to the successful transport overseas of each such hybrid or variety and to its subsequent ripening to an attractive colour.

The principal causes of wastage in banana shipments are due to main-stalk rot resulting from the attacks of various fungi diseases, and "finger dropping," which may be due to the advanced stage of main-stalk rot, to mechanical injury to individual fingers, or to late maturity.

The Gros Michel, Lacatan and Cavendish were found to be varieties of decided value. The earlier trials established the following facts:—correlation between the conditions in respect of soil and climate under which the fruits were grown before storage and the behaviour in storage and ripening; excessive tenderness and susceptibility to bruising usually attributed to the Cavendish variety and believed to necessitate its crating were not confirmed, careful handling obviating the major objection of breaking off of fingers; and thirdly, much of the irregular colouring up of fingers and premature ripening of lower hands was found to be due to fungal attack as a result of insect punctures or mechanical damage during harvesting and transport.

There is a wide range of maturity at which the Cavendish variety may be picked, so that it will stand, uncrated, the usual bulk storage conditions for as long as 18½ days. While on being ripened it has not the rich hue of the Gros Michel, the better and more vigorous bunches were extraordinarily systematised and attractive, especially before the onset of freckling, concomitant with late maturity in this variety. If these results are confirmed in later storage trials, a hopeful note may be sounded regarding the possibilities of the West Indian Cavendish as a substitute for the Gros Michel.

Experimental work on various fungi was carried out to determine the general behaviour of such infection on the banana under commercial storage conditions. Such infections were considered from the point of view of the rate of growth of the fungi at different temperatures and their parasitic behaviour as determined by inoculation experiments.

As a preliminary, observations on the rate of growth of six fungi affecting the banana were carried out by culturing the fungi. In this manner the rate of growth of fungi at different temperatures was ascertained, an important consideration in connection with these investigations.

Inoculation experiments with various fungi were carried out to observe the effect of each fungus on the bunch. The diseases that have been studied in this connection are *Thielaviopsis paradoxa* (Von Hohned); *Gloeosporium musarum* (Cooke and Massee); *Botryodiplodia theobromae* (Pat); and *Fusarium spp.*

It was found that wastage in banana cargoes or in stored fruit is due mainly to the activities of a number of fungi or moulds. These are responsible for an important downward rotting of the main-stalk, for "finger dropping" and the blemishing and rotting of fruit. Infections may become established in the field or during storage. Rough handling of fruit with the consequent bruising greatly accentuates the amount of disease. Further, temperature plays an important part in the growth activities of moulds. Low storage temperatures curtail the amount of disease.

The next stage in the investigation was to consider the nature and incidence of diseases in large consignments of fruit during ocean transport.

For some years main-stalk rot has been prevalent in cargoes on arrival at the English port. It was found that the length of time that elapsed in ships before refrigeration of the cargoes encouraged the early development of main-stalk rot.

The authors recommend the following to reduce losses attendant on main-stalk rot. Firstly, cutting stalks long—about 10 inches—when reaping bunches. Secondly, that after inspection at quay side the stems be fresh cut with a sharp instrument and thoroughly treated with vaseline. In this way the fungal organisms which have become established in the long interval between reaping and loading will be eliminated. Thirdly, commencing refrigeration as soon as possible after loading, and fourthly, rapid cooling of the cargoes.

The use of brown paper in other countries for the transport of bananas has made it possible to ensure that the fruit shall arrive at its destination with the minimum of blemishes. The use of such bags, however, affects very materially the composition of the air around the fruit and the temperature of the fruit itself. These factors may affect the fruit considerably with serious consequences, especially when the ship is delayed. The danger from these causes was obviated to a large degree by punching holes $\frac{3}{8}$ inch diameter, set 4 inches apart. A comparison of the condition of the fruit in bags so treated with untreated bags demonstrated that while over 60 per cent. of the bunches in the unpunched bags shewed acute

main-stalk rot, there was an incidence of 6 per cent. only in the corresponding punched set. Furthermore, cooling with the latter method was more rapid.

Bananas for certain markets are cut into hands and crated. This tends to uneven and more rapid ripening. As a result of investigations, the authors emphasise the necessity for careful selection of fruit at the correct stage of maturity; shortening as much as possible the interval between harvesting and transference to the cool storage chamber; thorough pre-cooling of the whole bunch prior to cutting into hands and the application of vaseline for journeys of ten days or longer; rapid transference, in insulated conveyors if necessary, from the pre-cooling station in to the ship's hold; the maintenance of a temperature of 50°F.—55°F. in the case of Cavendish and Gros Michal varieties; the complete change of the storage atmosphere at least once per day; the use of "dunnage" on crates, and the provision of vertical breaks in the cargo stacks, when these are large.

The appendix to this volume gives a review of the literature on fungal diseases of banana fruits.

D. H. G.

The Feeding Value of Para Rubber Seed Meal.

The problem of the utilisation of Para rubber seed meal as a feeding stuff has been under consideration for many years. Trials carried out with the cake for feeding cattle and sheep by the South Eastern Agricultural Collage at Wye, Kent, proved that it might be successfully used for this purpose.

The question has again been recently considered at the Virginia Agricultural Experiment Station, where feeding trials with Para rubber seed meal have been conducted with dairy cows to ascertain its value for milk production and the digestibility of its constituents. The results of these experiments are reported in *Technical Bulletin, No. 41* April 1931, *Virginia Agricultural Experiment Station.* The trials have indicated that Para rubber seed meal may be used as a medium protein concentrate in rations for dairy cows. It is palatable, neither laxative nor constipating, and is apparently equal to linseed meal in supporting milk production. It is suggested that, whenever available at a reasonable price, rubber seed meal of good quality might be profitably used as an ingredient in the rations of dairy cows.—*Bulletin of the Imperial Institute Vol XXVIII No. 4 1930.*

Departmental.

FROM THE DISTRICTS.

The Weather.

In general the weather during the month was normal for the season, that is, fairly hot in the mornings with frequent and often heavy showers or thunderstorms in the afternoons, more especially during the second half of the month. In Pahang, conditions may more fairly be described as hot and dry.

Remarks on Crops.

Rubber.—Local prices for rubber from small holdings again declined, being $8—$14 per picul for smoked sheet, $6—$12.75 for unsmoked sheet and $3—$6.50 for scrap. It is remarkable that there is still a market for scrap and other low grades of rubber and at comparatively steady prices which do not fluctuate in sympathy with those of the higher grades.

There was an increase in the number of untapped rubber holdings in the Settlement of Penang, in Selangor and the Negri Sembilan. In the latter State the owners were mostly engaged on preliminary work in their rice fields.

The somewhat irregular wintering had terminated or nearly terminated at the end of the month.

Oidium Leaf Mildew reappeared over a considerable area in the Negri Sembilan and Malaccca where it was also present in 1930. Reports of outbreaks were also received from a few estates in Selangor and Perak and from several in Province Wellesley. The attack was confined to the young leaves on the later wintering trees. Towards the end of the month heavy showers of rain appeared to check its spread and in no case was the attack sufficiently serious to call for control measures. The infected areas in the Negri Sembilan and Malacca were inspected by an officer of the Pathological Division of the Rubber Research Institute in company with the two Agricultural Field Officers concerned.

The showery weather caused a recrudescence of Mouldy Rot disease in parts of Southern Perak and Selangor where control measures received careful attention. Elsewhere the disease was not in evidence.

In Kedah a somewhat serious outbreak of a leaf spot disease, caused by *Helminthosporium Heveae*, occurred on certain estates, mainly on young foliage.

Padi.—By the end of the month the padi harvest for the season 1930—31 was practically completed. The yields in Kedah and Province Wellesley were good. The crop in the Dindings was destroyed by drought.

Preliminary work for the coming season's crop had been commenced in the inland Districts of Perak South, along the Pahang River, in Selangor, the Negri Sembilan and Malacca.

The padi in the Sabak Bernam District is nearly all planted as a catch crop with coconuts, until the latter are from 3 to 4 years old. Consequently, there is likely to be a rapid annual diminution in the planted area.

As a result of the visit of the Propaganda Caravan, over 1,000 gantangs of seed padi of various strains have been purchased by applicants in the Negri Sembilan at 10 cents a gantang.

In Selangor the stem borer, *Schoenobius incertellus,* was found attacking nursery seedlings only twelve days old. Stem borers were also found to be numerous in the stubble and volunteer padi in the sub-district of Sabak Bernam.

Coconuts.—In Selangor the decline in crops and in copra content of nuts reported in March continued during April. In the same State an outbreak of the nettle caterpillar, *Setora nitens,* at Pulau Lumut was satisfactorily controlled by hand picking.

Fruit.—Pineapples are being planted in the Kulim District and fruit trees and bananas in the Northern Districts of Kedah. The common native fruit trees such as the durian, mangosteen, rambutan and horse mango were in flower in Kedah, Province Wellesley and Penang. Cashew nuts were plentiful in the two latter localities. Heavy crops of bananas and pineapples were obtained in Province Wellesley South, while from the Jelebu District of the Negri Sembilan between 40 and 50 tons of bananas were despatched for sale in Seremban and Kuala Lumpur. In Selangor the price of pineapples for canning varied from 50 to 80 cents per hundred.

Coffee.—There was considerable variation in local prices for coffee, 10 to 11 cents a kati (1½ lbs.) being given in Temerloh District and 16—20 cents in Raub District of Pahang, while in Selangor the price in the coastal Districts was between 10 and 14 cents, but in Ulu Langat District 15 cents a kati.

An outbreak of the Coffee Hawk Moth *Cephanodes hylas* at Bukit Kapar in Selangor was successfully controlled by hand picking, but similar measures in Kuala Selangor District were not so thoroughly executed.

Tea.—In Selangor there was a further decline in the price of local Chinese tea, the first grade selling for 48 cents a kati as compared with 50—55 cents during March.

During last year, demonstrations at the Government Experimental Plantation, Serdang, were given by the Chinese Sub-Inspector of Agriculture to Chinese tea growers from Sungei Balak. The growers have been quick to profit by the knowledge so gained, as is shown by the improvement in methods of soil conservation and in pruning now practised on their holdings.

Notes on Demonstration Stations and Padi Test Plots.

The Padi Test Plot at Glugor in Penang was planted with six strains of short duration padi to test the possibility of obtaining two crops of padi a year where a good supply of irrigation water is obtainable.

The new layout of the Demonstration Station at Kuala Kangsar was completed in readiness for planting. Good progress was made in developing the new Station at Sungei Udang in Malacca, while work was commenced on three other new Stations at Rembau in the Negri Sembilan and at Kuantan and Temerloh in Pahang.

School Gardens.

Progress was made in replanting the beds in most gardens. Distributions of planting material were made by the Department in Pahang. Cultivation and general arrangements show improvement in many gardens.

Propaganda Caravan.

During the month the inter-departmental propaganda caravan visited various centres in the sub-district of Tanjong Malim in Perak and Ulu Selangor District in Selangor. Exhibits of departmental pedigree strains of padi, padi stem borers, and rat destruction methods were used to illustrate a lecture in the afternoons; while at night, a lantern lecture on Mouldy Rot Disease of rubber was given and the Malay cinematograph film on the subject of co-operation was projected.

Rat Destruction.

In Province Wellesley 385,616 rat tails were collected, mostly from nests in the bunds of padi fields, though nests are reported to be fewer this year than in previous seasons. In Krian 67,580 tails were obtained and a stock of poisoned bait was prepared in readiness for the coming season. It has been decided to discontinue the payment of rewards for tails in these two areas after the 15th. May next, but to continue the supply of traps and poisoned baits and to encourage padi growers to make use of these to protect their crops from damage.

In Malacca the campaign is being continued on the same lines as formerly, except that the reward will be reduced to 1 cent for 4 tails during the inter-crop season. During the month 124,800 tails were collected. Interest in this work is growing as is evinced by the progressive increase in the monthly catches.

DEPARTMENTAL NOTES.

Visits of the Director.

The Director of Agriculture, S.S. and F.M.S. visited Malacca on April 6th. and 7th. He inspected the Pulau Gadong Padi Experiment Station, including the new pumping plant, and also the new experiment station at Sungei Udang. Various matters were discussed with the Hon'ble Resident Councillor, Malacca, and the Agricultural Field Officer.

A visit of inspection to Fraser's Hill was made from 18th. to 20th. in connection with the new Dairy Farm.

School of Agriculture, Malaya.

The Chief Secretary to Government, F.M.S., has appointed an Advisory Committee for the Government School of Agriculture, Malaya, Serdang, constituted as follows :—

The Director of Agriculture, S.S. and F.M.S. (*Chairman*);
The Director of Co-operation, F.M.S. and S.S.,
The Director of the Rubber Research Institute;
The Chief Inspector of English Schools, S.S. and F.M.S.;
The Hon'ble Mr. J. S. Arter;
The Hon'ble the Undang of Rembau;
The Hon'ble Mr. Tan Cheng Lock;
The Hon'ble Mr. Veerasamy;
The Vice-Principal of the School (*Secretary*).

(Notification No. 3208, F.M.S. Government Gazette Vol. XXIII, No. 9 24th. April, 1931.)

Official Opening of School of Agriculture, Malaya.

The official opening of the School of Agriculture, Malaya, will be performed by H. E. The Officer Administering Government and Acting High Commissioner for the Malay States, Mr. John Scott, C.M.G., at 4.30 p.m. on Thursday 21st. May, 1931.

Leave.

Mr. F. S. Banfield, Horticultural Assistant, has been granted seven months and eleven days' leave on full pay with effect from the 21st. February, 1931, inclusive.

Mr. J. Lambourne, Assistant Agriculturist, has been granted nine months and seven days' leave on full pay with effect from the 4th. April, 1931, inclusive.

Mr. C. L. Newman, Agricultural Field Officer, has been granted seven months' leave on full pay with effect from the 11th. April, 1931, inclusive.

Mr. F. G. Spring, Agriculturist (Rubber) seconded to the Co-operative Department, has been granted seven months and twenty-four days' leave on full pay with effect from the 13th. April, inclusive.

Mr. J. H. Dennett, Assistant Chemist, has been granted ten months' leave on full pay with effect from the 18th. April 1931, inclusive.

Mr. R. B. Jagoe, Assistant Economic Botanist, has been granted nine months and six days' leave on full pay with effect from the 2nd. April, 1931, inclusive.

Staff Changes.

The following staff changes were effected from 11th. April, 1931.

Mr. R. G. Heath, Agricultural Field Officer, Pahang West, transferred to Malacca to act as Agricultural Field Officer, Malacca.

Mr. J. Fairweather, Acting Agricultural Field Officer, Province Wellesley and Penang replaced Mr. Heath in Pahang West.

Mr. H. J. Simpson, Agricultural Field Officer, Perak South was transferred to act as Agricultural Field Officer, Province Wellesley and Penang.

Inche Arifin bin Haji Abas, Senior Agricultural Assistant, Batang Padang, was appointed to act temporarily as Agricultural Field Officer, Perak South.

Statistical.

MARKET PRICES.

April, 1931.

Rubber.—The rubber market has experienced a still further steady decline in prices during the month, a new lowest level on record being established on the last two days of the month, when the Singapore price was 8⅝ cents per lb. and the London price 2 13/16d. per lb. The average price for April in Singapore was 9.7 cents per lb. and in London 3.3d. per lb. compared with 12 cents and 3.8d. respectively for March.

Palm Oil.—A London correspondent writing on 5th. March stated that he doubted whether Malayan oil in barrels would make £20 per ton c.i.f. (i.e. £15 ton f.o.b.) The Sumatran product has also declined. On the other hand, West African is now more in line, while the premium for Malayan is not so great. Writing from London on 9th. April this correspondent wrote: "April shipment is not worth more than £19-10-0 c.i.f. to-day. Consumers are right out of the market. Oils and oil seeds generally seem to be slipping back a little, and no doubt Palm Oil is following in sympathy."

Copra.—The market has declined throughout the month and supplies are coming in freely. The highest price for sun-dried was $5.80 per picul, the lowest $5.55 per picul. "Mixed" highest price was $5.40, lowest $5.15 per picul. Average Singapore prices for April were; Sun-dried $5.58 compared with $5.97 in March; Mixed $5.33 compared with $5.58 per picul for the previous month. Copra cake remained at around $1.60 per picul.

Pineapples.—The canned pineapple packing factories have been working at high pressure. There has been a good demand for ready delivery, but buyers are only interested in forward positions at very low prices. Average prices per case in Singapore for April were:—1½ lb. cubes, $3.20; 1⅛ lb. sliced flat, $3.05; 1½ lb. sliced tall, $3.36. Corresponding figures for March were $3.28, $3.14, and $3.42.

Tapioca.—A collapse has taken place on the market due to poor demand at wretched prices and all grades have suffered thereby. Flake, fair has dropped from $4.10 to $3.10 per picul, the average price for the month being $3.59 per picul against $4.20 for March. Pearl, seed declined from $5.25 to $4.50 per picul, the average price being $4.81 compared with $5.25 in March; while Pearl, medium, experienced a decline from $6.00 to $5.00 per picul, the average price being $5.50 per picul compared with an average of $6.00 for March.

Sago.—The demand has been extremely limited. Prices were maintained early in the month by Japanese buying, but by the end of the month arrivals were more than sufficient to meet present requirements, and the price of sago flour dropped to the lowest on record ($1.87½ per picul). Average Singapore prices in April: Pearl, small, fair $4.94; Flour, Sarawak, fair, $2.15 per picul. Corresponding prices in March were $5.75 and $2.44 per picul.

Coffee.—Singapore prices for Java Robusta have varied from $19 to $16.50

per picul on a falling market. The average price for this grade was $17.75 per picul. Palembang coffee has also declined from $12.65 to $11.75, the average price for the month being $12.14 per picul.

Areca nuts.—Prices for this commodity are still declining on the Singapore market. This applies especially to the "Red whole" as the Saigon demand is very flat. Average prices per picul of the various descriptions were as follows:—Palembang whole, $6.14; Bila whole, $5.37; sliced, $13.92; Red whole, $5.75; Split, $5.25; Kelantan split $6.15.

Rice.—Singapore prices for imported rice have remained fairly steady throughout April. Average prices per coyan were as follows:—Siam No. 2., $164; Saigon No. 1, $153; Rangoon No. 1, $135. The corresponding prices for the previous month were $165, $154, $139.

Gambier.—After many months of a featureless market, there is now more interest in this product and business has passed at comparatively high prices. Average Singapore prices for April were:—Block, $11.31 against $9.75 per picul in March; cube No. 1., $15.37 compared with $15 in March.

Pepper.—Singapore market easier with buyers, for the most part, disinclined to operate. Average prices per picul in April:—Singapore, black, $20.31; Singapore, white, $34.56; Muntok white, $35.56. Prices for March were $21.00; $38.50; $39.75 per picul respectively.

Cloves.—Average Singapore prices in April were; Zanzibar, $50.25; Amboina, $48.62 per picul. The corresponding prices for March were $62 and $59 per picul.

Nutmegs.—Average prices in Singapore for the month were, for 110 per lb. $20.87 per picul; 80 per lb., $25.87 per picul. Corresponding prices in March were $23.37 and $27.75 per picul.

Mace.—Average Singapore prices for April: Siouw, $64.50 per picul against $79.75 in March; Amboina $47.00 per picul against $59.50 per picul in March.

The above prices are based on London and Singapore quotations for rubber; on the Singapore Chamber of Commerce Reports published in April, and on other local sources of information. Palm Oil Reports are kindly supplied by Messrs. Lewis and Peat (Singapore) Ltd., and reports on the Singapore prices for Coffee and Areca nuts by the Lianqui Trading Company of Singapore.

1 picul = 133 1/3 lbs. 1 coyan = 40 piculs.

The dollar is fixed at two shillings and four pence.

NOTE. The Department of Agriculture will be pleased to assist planters in finding a market for agricultural products. Similar assistance is also offered by the Malayan Information Agency, 57, Charing Cross, London, S.W. 1.

MALAYA RUBBER STATISTICS.

Areas untapped during the month of January, 1931.

Estates of 100 Acres and over.

Territory.	Total area of Estates entirely ceased tapping.	Total area rested.	Total area not tapped.
	Acres.	Acres.	Acres.
Perak	2,811	35,045	37,856
Selangor	3,549	50,839	54,388
Negri Sembilan ...	5,580	25,068	30,648
Pahang	5,199	5,122	10,321
Total F.M.S. ...	17,139	116,074	133,213*
Malacca	1,212	22,745	23,957
Province Wellesley ...	1,779	11,592	13,371
Dindings	.....	1,809	1,809
Singapore	5,841	3,152	8,993
Penang	691	107	798
Total S. S. ...	9,523	39,405	48,928*
Grand Total ...	26,662	155,479	182,141

*Of the total Federated Malay States area of 133,213 acres 32,373 acres were rested due to the adoption of the A.B.C. system of tapping and that of the total Straits Settlements area of 48,928 acres 10,804 acres were similarily rested.

Areas untapped during the month of February, 1931.

Estates of 100 acres and over.

Territory.	Area of Estates entirely ceased tapping.	Areas Rested.		Total area untapped.
		Out of tapping pro-tem.	Due to adoption of A.B.C. system of tapping.	
	Acres.	Acres.	Acres.	Acres.
Perak ...	1,789	25,707	11,251	38,747
Selangor ...	5,176	34,782	17,761	57,719
Negri Sembilan...	8,923	28,042	1,316	38,281
Pahang ...	1,186	5,243	.....	6,429
Total F.M.S.	17,074	93,774	30,328	141,176
Province Wellesley ...	1,977	6,521	3,608	12,106
Dindings ...	.....	1,873	.....	1,873
Malacca ...	2,273	21,235	4,359	27,867
Penang ...	584	693	.....	1,277
Singapore ...	3,148	11,008	.....	14,156
Total S.S.	7,892	41,330	7,967	57,279
Grand Total.	25,066	135,104	38,295	198,455

Areas untapped during the month of March, 1931.

Estates of 100 Acres and over.

TERRITORY.	Areas Rested.		Total area Untapped *
	Total areas of Estates which have entirely ceased tapping.	Areas on Estates partly out of tapping Pro-tem.	
	Acres.	Acres.	Acres.
Perak	9,701	25,191	34,892
Selangor	6,370	37,915	44,285
Negri Sembilan ...	8,031	28,449	36,480
Pahang	5,924	5,262	11,186
Total F.M.S. ...	30,026	96,817	126,843
Province Wellesley ...	3,378	6,402	9,780
Dindings	.....	1,548	1,548
Malacca	2,014	23,007	25,021
Penang	1,142	138	1,280
Singapore	6,747	7,280	14,027
Total S.S. ...	13,281	38.375	51,656
Grand Total ...	43,307	135,192	178,499

* Areas rested due to the adoption of A.B.C. and similar systems of tapping in F.M.S. and S.S. during March (not included in the above figures) were :—

F.M.S.	...	36,035 Acres
S.S.	...	8,665 „
Total	...	44,700 „

J. GORDON-CARRIE,
Deputy Registrar-General of Statistics,
S.S. & F.M.S.

MALAYA RUBBER STATISTICS

TABLE I

STOCKS, PRODUCTION, IMPORTS AND EXPORTS OF RUBBER, INCLUDING LATEX, CONCENTRATED LATEX AND REVERTEX, FOR THE MONTH OF MARCH, 1931, IN DRY TONS.

Territory	Stocks at beginning of month 1			Production by Estates of 100 acres and over		Production by Estates of less than 100 acres (estimated) 2		Imports				Exports (including re-exports)				Stocks at end of month		
								during the month		during the year 1931		during the month		during the year 1931				
	Ports	Dealers	Estates of 100 acres and over	During the month	during the year 1931	during the month	during the year 1931	Foreign	From Malay States	Foreign	From Malay States	Foreign	Local	Foreign	Local	Dealers	Estates of 100 acres and over	Ports
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
MALAY STATES :—																		
Federated Malay States	...	15,016	15,129	11,447	35,098	10,235	29,546	Nil	17	Nil	26	15,327	8,033	41,747	22,095	14,788	13,696	...
Johore	...	2,375	4,712	3,702	10,763	4,319	12,610	Nil	3	Nil	5	722	7,652	1,956	21,599	2,252	4,417	...
Kedah	...	364	2,406	1,648	6,101	973	3,373	Nil	Nil	Nil	Nil	774	2,331	2,040	8,197	332	1,954	...
Perlis	...	5	9	8	23	12	39	Nil	Nil	Nil	Nil	Nil	19	Nil	68	9	6	...
Kelantan ...	...	224	82	164	561	750	1,632	2	Nil	9	Nil	100	715	209	1,797	299	108	...
Trengganu ...	...	55	50	134	287	67	143	Nil	Nil	Nil	Nil	Nil	201	Nil	430	55	50	...
Total Malay States	...	17,971	22,388	17,103	52,833	16,356	47,343	2	20	9	31	16,923	18,951	45,952	54,186	17,735	20,231	...
STRAITS SETTLEMENTS																		
Malacca ...	...	3,518	1,658	1,164	3,494			Nil		Nil		5,841		16,280		2,827	1,416	...
Province Wellesley	..	11[illegible]	564	342	1,266	(2)	(2)	Nil		Nil						96	428	..
Dindings ...	...	152	125	94	294	2,000	6,000	Nil	18,931	Nil	54,155	5,874	Nil	18,415	Nil	172	96	...
Penang	1,877	5,047	10	5	24			832		2,441						5,716	5	1,907
Singapore ...	3,301	34,151	811	205	573			8,973		24,310		19,951		51,472		35,506	316	2,076
Total Straits Settlements	5,178	42,886	2,668	1,810	5,651	2,000	6,000	9,805	18,931	26,751	54,155	31,666	Nil	86,167	Nil	44,317	2,261	3,983
TOTAL MALAYA	5,178	60,857	25,056	18,913	58,484	18,356	53,343	9,807	18,951	26,760	54,186	48,589	18,951	132,119	54,186	62,052	22,492	3,983

TABLE II

DEALERS' STOCKS, IN DRY TONS 3

Class of Rubber	Federated Malay States	S'pore	Penang	Province We'sly D'dings M'cca.	Johore	Total
20	21	22	23	24	25	26
Smoked sheet	11,467	20,456	1,974	2,749	367	35,013
Crepe	660	11,491	1,374	794	180	14,499
Unsmoked sheet }	1,597 }	3,559	268	152	(734	7,854
Scrap and lump }	1,064 }				471)	
Total all Grades	14,788	35,506	5,716	3,095	2,252	61,357

TABLE III

FOREIGN EXPORTS

PORTS	For month	during the year 1931
Singapore ...	32,339	84,134
Penang ...	9,882	31,422
Port Swettenham.	5,866	14,622
Malacca ...	502	1,941
MALAYA ...	48,589	132119

TABLE IV

THE PROPORTION OF FOREIGN EXPORTS REPRESENTING DOMESTIC PRODUCTION 4

AREA	For month	during the year 1931
Malay States ... }	39,773	106325
Straits Settlements }		
MALAYA ...	39,773	106325

Notes :—1. Stocks on estates of less than 100 acres and stocks in transit on rail, road or local steamer are not ascertained.

2. The production of estates of less than 100 acres is estimated from the formula : Production + Imports + Stocks at beginning of month = Exports + Stocks at end of month, *i.e.*, Column [7] = Columns [13] + [14] + [17] + [18] + [19] − [2] − [3] − [4] − [5] − [9] − [10] For the Straits Settlements, the figure is an estimate based on the average found for the year 1930. Purchases by dealers S.S. from S.S. estates of less than 100 acres during the month amounted to 1,877 tons, and to 1,872 tons during February (not previously reported).

3. Dealers' stocks in the Federated Malay States are reduced to dry weights by the following fixed ratios: unsmoked sheet, 15%; wet sheet, 25%; scrap, lump, etc., 40%; stocks elsewhere are in dry weights as reported by the dealers themselves.

4. The proportion of foreign exports representing Malayan domestic production is estimated by deducting the average monthly dry weight of foreign imports over a period of 2 months from the gross foreign exports of the later month, the foreign exports of the Malay States being domestic production.

5. The above, with the omission of certain explanatory notes, is the Report published by J. I. Miller, M. C. S., Acting Registrar-General of Statistics, S.S. and F.M.S., at Singapore on April, 19, 1931.

GENERAL RICE SUMMARY.

March, 1931.

Malaya.—By the end of the month harvesting was practically complete in almost all the rice growing areas. In the Dindings and Perak harvesting was still in progress. Yield estimates will probably be published in the next issue of this journal.

The net imports of rice into Malaya (i.e. consumption of foreign rice) in March, 1931 was 47,008 tons.

Of the total imports of foreign rice Siam provided 52 per cent., Burma 42 per cent., French Indo-China 5 per cent. and other countries 1 per cent.

The total exports of rice from Malaya during March were 13,474 tons of which only 9 tons were locally produced.

India.—The total foreign exports (as reported by the *Indian Trade Journal)* during January, 1931 were 146,000 tons against an average in January for the last six years of 116,000 tons.

Java, Madura and N.E.I.—The position of the crops at the end of February, 1931 was substantially the same as that at the same date last year.

French Indo-China.—His Britanic Majesty's Consul-General at Saigon reports for the month of February, 1931, as follows :—

"The latest reliable estimate puts the exportable surplus for 1931 at 1,200,000 metric tons.

For the first two months of 1931 the amount exported only amounted to 113,442 tons as compared with 227,680 tons during the same period in 1930.

An annual transaction took place at the end of the month when 1,000 tons of Siam rice was transhipped in Saigon for Madras."

The following notes and tables will be of interest.

Average wholesale Siam rice prices per ton in Singapore, were in dollars (Straits) :—

	1930	1931			Increase (—) or decrease (—) % on previous month.
	Average Jan.-Dec.	January	February	March	
Singapore No. 1 ...	130	94	89	80	— 10.1
Singapore No. 2 (Special)...	118	85	80	70	— 12.5
Singapore No. 2 (Ordinary)	108	76	73	65	— 11.0
Siam White Broken A. 1...	86	58	51	48	— 5.9
Siam White Broken C. 1...	81	55	48	45	— 6.2

The stocks of rice as reported by Wholesale Dealers in Singapore, Penang and Malacca during the following periods were, in tons :—

1930				1931		
September	October	November	December	January	February	March
25,730	17,678	13,492	22,691	15,854	20,378	21,803

Net Imports of Rice into Malaya (Consumption of Foreign Rice) March, 1931 (in tons.)

Into	Tons	Percentage	Percentage 1930
Singapore ...	22,624	48	45
Penang ...	9,160	19	24
Malacca ...	4,246	9	3
F.M.S. ...	10,318	22	25
U.M.S. ...	660	2	3
Total ...	47,008	100	100

Average Declared Trade Values and Retail Market Prices.

Monthly	Retail Market prices in cents per Gantang of No. 2 Siam Rice					
	1930			1931		
	Singapore	Penang	Malacca	Singapore	Penang	Malacca
January	54	56	52	37	44	38
February	51	55	52	35	40	35
March	47	54	51	35	38	36

METEOROLOGICAL SUMMARY, MALAYA. MARCH, 1931.

Locality	Air Temperature in degrees Fahrenheit							Earth Temperature		Rainfall									Bright Sunshine			
	Means of			Absolute Extremes						Total		Most in a day	Number of days						Total	Daily Mean	Per cent	Length of Day
	A. Max.	B. Min.	Mean of A and B	Highest Max.	Lowest Min.	Lowest Max.	Highest Min.	At 1 foot	At 4 feet			Amt.	Precipitation* .01 in or more.	Precipitation, .04 in or more	Thunder-storm	Thunder heard	Fog morning obs.	Gale force 8 or more				
	°F	°F	°F	°F	°F	°F	°F	°F	°F	in.	mm.	in.							hr.	hr.	%	hr.
Railway Hill, Kuala Lumpur, Selangor ...	94.5	73.6	84.1	97	70	90	76	85.4	85.1	7.30	185.4	2.30	17	15	3	24	1		228.15	7.36	61	12.1
Bukit Jeram, Selangor ...	91.5	74.3	82.9	94	72	88	77	89.1	89.7	2.15	54.6	0.49	13	10	3	26	1		256.45	8.27	68	12.1
Sitiawan, Perak ...	91.8	73.9	82.9	95	70	88	77	86.0	85.2	2.30	58.4	0.57	10	10	7	24			250.40	8.08		
Kroh, Perak ...	93.3	69.4	81.3	95	64	91	73	84.8	83.7	2.40	61.0	0.84	7	5		5	2		284.60	9.18		
Temerloh, Pahang ...	93.3	73.5	83.4	96	68	88	76	87.9	86.5	2.65	67.3	1.21	10	8	1	11	7		249.85	8.06	67	12.1
Kuala Lipis, Pahang ...	93.0	72.3	82.7	95	67	89	76	85.3	84.8	4.42	112.3	1.46	9	7	3	10	11	2	257.40	8.30	70	12.1
Kuala Pahang, Pahang ...	87.7	75.5	81.6	92	72	81	83	87.3	86.0	3.96	100.6	1.32	12	7	2	3			269.40	8.69	72	12.1
Mount Faber, Singapore ...	89.9	74.7	82.3	94	73	84	77	81.9	82.4	5.18	131.6	1.23	17	12	3	16			196.00	6.32	52	12.1
Butterworth, Province Wellesley ...	91.2	75.4	83.3	95	72	88	78	87.6	85.9	1.47	37.3	0.74	7	4	1	15		1	290.10	9.36		
Bukit China, Malacca ...	89.2	74.8	82.0	95	72	84	77	85.8	85.9	6.68	169.7	2.39	14	12	7	14			241.25	7.78	64	12.1
Kluang, Johore ...	91.7	72.8	82.3	95	69	84	76	83.5	83.0	4.94	125.5	1.12	14	11	1	17	6		207.85	6.70	55	12.1
Bukit Lalang, Mersing, Johore	86.3	72.9	79.6	89	68	82	80	82.1	81.7	6.84	173.7	1.80	12	9		1	2		264.75	8.54	71	12.1
Alor Star, Kedah ...	95.5	72.2	83.9	99	66	90	75	86.6	86.3	1.45	36.8	0.49	8	3	1	12			293.20	9.46	78	12.1
Kotal Bahru, Kelantan ...	90.3	71.6	80.9	94	66	88	76	83.6	83.6	0.45	11.4	0.40	2	2		1			311.70	10.05	84	12.0
Kuala Trengganu, Trengganu	89.0	72.8	80.9	92	69	86	75	84.3	84.5	0.42	10.7	0.27	7	3			1		315.00	10.16	84	12.1
HILL STATIONS.																						
Cameron's Highlands, Rhodendron Hill, Pahang 5120 ft. ...	75.2	59.4	67.3	79	57	70	62			4.63	117.6	2.09	8	7		8	1		219.15	7.07	58	12.1
Cameron's Highlands, Tanah Rata, Pahang 4750 ft. ...	74.9	53.5	64.2	78	46	71	60	69.7	69.2	4.33	110.0	1.82	11	7		9			209.20	6.75	56	12.1
Fraser's Hill, Pahang 4268 ft.	76.0	63.0	69.5	80	60	73	65	73.5	73.3	7.57	192.3	1.85	14	13	2	11	17		221.05	7.13	59	12.1

*Precipitation .01 inch or more when measurement is in inches .2mm. or more when measurement is in millimetres.
Compiled from Returns supplied by the Meteorological Branch, Malaya.